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THE COMMONWEALTH OF PENNSYLVANIA.

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AGRICULTURE OF PENNSYLVANIA,

CONTAINING

REPORTS

OF THE

STATE BOARD OF AGRICULTURE,

THE

STATE AGRICULTURAL SOCIETY, THE STATE DAIRYMEN'S ASSOCIATION, THE STATE HORTICULTURAL ASSOCIATION AND THE STATE COLLEGE,

FOR 1888.

HARRISBURG:
EDWIN K. MEYERS, STATE PRINTER.
1888.

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OFFICE OF PENNSYLVANIA STATE BOARD OF AGRICULTURE,
HARRISBURG, PA., *January 1, 1889.*

To the Honorable Senate and House of Representatives of the General Assembly of Pennsylvania:

GENTLEMEN: In accordance with the provisions of the act of May 8, 1876, and by direction of the Board, I have the honor to herewith present the twelfth annual report of the State Board of Agriculture.

Respectfully yours,
THOMAS J. EDGE,
Secretary.

OBITUARY.

JACOB G. ZERR.

BORN SEPTEMBER 4, 1818.
DIED DECEMBER 3, 1887.

Jacob Geiger Zerr, late the representative of Berks county in this Board, was born in Robeson township, Berks county, September 4, 1818; at the age of twelve years he moved with his father to a farm in Union township, and at his father's death became owner of the farm, upon which he continued to reside until his death.

He was prominent in all of the agricultural and horticultural movements in his native county, and was one of the promoters and prominent members of the Farmers' Club of Berks County, and when this organization was merged into the Berks County Agricultural Society, he became an active member of the latter; in 1877 he was elected president of the Society, and for six years faithfully served its members in that capacity, and the present excellent condition of the society is largely due to his active coöperation and assistance in its movements. In 1883 he was elected to represent the Society in the State Board of Agriculture, and continued as its representative to the time of his death, having been reëlected in 1886 for a term of three years.

In addition to the prominent positions to which he was called as one of the representative agriculturists of his county, Mr. Zerr also occupied numerous positions of honor and trust which were accorded to him by his fellow citizens on account of his sterling worth and rigid honesty; he was for many years a school director, and also served as township assessor for several terms, and in many other ways was prominent as a citizen and as a farmer.

As a member of this Board he was noted for his unassuming worth and for his practical suggestions which were always urged upon what he believed to be the side of right and against anything which he believed to be wrong; as a member he was unassuming and did not press his opinions upon the Board unsolicited, but at the proper time and in his own way he stated his opinions and convictions without fear or favor to any. He served upon several prominent committees, and his practical discussions relating to topics coming before our meetings are well attested by our minutes.

In religion Mr. Zerr was a zealous Lutheran; he founded the first Lutheran Sunday school at Geigerstown, and continued to be its superintendent for thirty years. When St. James' Lutheran church was founded he was prominent in its support, and gave freely towards its maintenance.

In 1878 Mr. Zerr retired from active farm life, and turned the management of his farm over to his son; he, however, still retained the management of other business interests, and was in active business to within a short period of his death.

By his death Berks county loses an active and zealous representative, and our Board a conscientious and efficient member.

TWELFTH ANNUAL REPORT

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE

FOR THE YEAR 1888.

Members Ex-Officio.

Hon. James A. Beaver, *Governor.*
Hon. T. J. Stewart, *Secretary of Internal Affairs.*
Dr. E. E. Higbee, *Superintendent of Public Instruction.*
Col. Thos. McCamant, *Auditor General.*
Dr. G. W. Atherton, *President Pennsylvania State College.*

Appointed by the Governor.

	Term expires.
Dr. John P. Edge, Downingtown, Pa.,	1889
Will B. Powell, Springboro', Pa.,	1890
Col. James Young, Middletown, Pa.,	1891

Elected by County Agricultural Societies.

			Term expires.
Adams,	I. Garretson,	Bigler,	1891
Armstrong,	Jos. Painter,	Kittanning,	1890
Beaver,	A. L. McKibben,	Green Garden,	1890
Bedford,	S. S. Diehl,	Bedford,	1891
Berks,	G. D. Stitzel,	Reading,	1890
Bucks,	E. Reeder,	New Hope,	1889
Blair,	J. D. Hicks,	Altoona,	1889
Bradford,	H. L. Scott,	Towanda,	1889
Butler,	W. H. H. Riddle,	Butler,	1891
Chester,	Thos. J. Edge,	Harrisburg,	1890
Centre,	E. W. Hale,	Bellefonte,	1891
Clinton,	Joel A. Herr,	Cedar Springs,	1890
Columbia,	Chandlee Eves,	Millville,	1891
Crawford,	M. W. Oliver,	Conneautville,	1889
Cumberland,	C. H. Mullin,	Mt. Holly Springs,	1891
Dauphin,	G. Hiester,	Harrisburg,	1891
Delaware,	E. Harvey,	Chester,	1889
Erie,	J. C. Thornton,	Avonia,	1889
Indiana,	W. P. Gordon,	Black Lick,	1889
Jefferson,	J. McCracken, Jr.,	Frostburg,	1890
Juniata,	David Wilson,	Port Royal,	1891
Lackawanna,	H. H. Colvin,	Dalton,	1891
Lancaster,	H. M. Engle,	Marietta,	1889
Lawrence,	Sam'l McCreary,	Neshannock Falls,	1891
Lebanon,	C. R. Lantz,	Lebanon,	1891
Lehigh,	J. P. Barnes,	Allentown,	1890
Luzerne,	J. B. Smith,	Kingston,	1891
Lycoming,	Peter Reeder,	Hughesville,	1891
Mercer,	Robert McKee,	Mercer,	1890
Montgomery,	H. W. Kratz,	Trappe,	1890
Montour,	Thos. L. Clapp,	Limestoneville,	1889
Northampton,	A. D. Shimer,	Bethlehem,	1891
Northumberland,	John Hoffa,	Milton,	1890
Perry,	F. M. McKeehan,	Ferguson,	1891
Schuylkill,	J. T. Shoener,	Orwigsburg,	1889
Sullivan,	J. H. Lawrence,	Dushore,	1891
Susquehanna,	R. S. Searle,	Montrose,	1889
Tioga,	J. W. Mather,	Wellsboro',	1889
Union,	J. A. Gundy,	Lewisburg,	1890
Venango,	Wm. Gates,	South Oil City,	1889
Warren,	F. R. Miller,	Sugar Grove,	1889
Washington,	John McDowell,	Washington,	1890
Wayne,	N. F. Underwood,	Lake Como,	1888
Westmoreland,	F. Y. Clopper,	Greensburg,	1889
Wyoming,	N. G. Bunnell,	Vosburg,	1889
York,	W. S. Roland,	York,	1889

OFFICIAL LIST.

President.

Hon. James A. Beaver (*ex-officio*).

Vice Presidents.

M. W. Oliver,
Dr. J. P. Edge,
N. F. Underwood.

Executive Committee.

Hon. James A. Beaver,
C. C. Musselman,
E. Reeder,
W. S. Roland,
G. Hiester,
J. McDowell,
J. P. Barnes,
J. A. Herr,
Thos. J. Edge (*ex officio*).

Advisory Committee.

W. S. Roland,
J. P. Barnes,
Thos. J. Edge (*ex-officio*).
G. Hiester.

Secretary.

Thos. J. Edge, Harrisburg.

Botanist.

Thos. Meehan, Germantown.

Pomologist.

E. Satterthwaite, Jenkintown.

Chemist.

Prof. F. A. Genth, University of Pennsylvania.

Consulting Veterinary Surgeon.

Prof. R. S. Huidekoper, University of Pennsylvania.

Veterinary Surgeon.

Dr. F. Bridge, V. S., West Philadelphia.

Microscopists and Hygienists.

Dr. H. Leffmann, Philadelphia,
Prof. C. B. Cochran, West Chester.

Entomologist.

Prof. W. A. Buckhout, State College.

Ornithologist.

Dr. B. H. Warren, West Chester.

Meteorologists.

Prof. I. T. Osmond, State College,
J. L. Heacock, Quakertown.

Mineralogist.

Prof. Willcox, Philadelphia.

Geologist.

Prof. J. P. Lesley, Philadelphia.

Stenographer.

H. C. Demming, Harrisburg.

STANDING COMMITTEES—1888.

LEGISLATION.

M. W. Oliver,
Dr. J. P. Edge,
John McDowell,
J. A. Gundy.
W. S. Roland,
J. P. Barnes,
N. F. Underwood,
E. Reeder,
Thos. J. Edge.

FRUIT AND FRUIT CULTURE.

Joel A. Herr,
G. Hiester,
G. D. Stitzel,
John Hoffa,
F. R. Miller,
Will B. Powell,
H. M. Engle,
H. H. Colvin,
R. S. Searle,
C. T. Fox,
Dr. J. P. Edge,
N. F. Underwood,
F. M. McKeehan,
Dr. J. Calder,
H. A. Longsdorf.

WOOL AND TEXTILE FIBRES.

John McDowell,
M. W. Oliver,
S. P. Eby,
Dr. E. Harvey,
A. O. Hiester,
J. W. Axtel,
R. S. Searle,

FARM IMPLEMENTS.

Peter Reeder,
Chandlee Eves,
M. W. Oliver,
W. B. Powell,
E. Reeder,
R. S. Searle,
Wm. Gates,
N. F. Underwood,
I. Garretson,
E. W. Hale.

DAIRY AND DAIRY PRODUCTS.

Eastburn Reeder,
M. W. Oliver,
Prof. C. B. Cochran (Analytical Chemist).
R. S. Searle,
Chandlee Eves,
I. Garretson,
H. L. Scott.

POULTRY.

John Hoffa,
E. B. Esh,
John A. Follmer,
Oliver D. Schock.

GRASSES AND FODDER CROPS.

H. M. Engle,
N. F. Underwood,
N. G. Bunnell,
M. W. Oliver,
E. Reeder,
John Hoffa,
I. Garretson.

WATER SUPPLY FOR FARM BUILDINGS.

R. S. Searle,
J. C. Thornton,
Dr. J. P. Edge,
N. F. Underwood.

ROADS.

J. A. Gundy,
A. M. Fuller,
S. F. Hoffa,
Wm. Benedict,
J. P. Barnes,
John M. Miller,
John A. Woodward,
H. W. Kratz,
J. W. Hickman,
Wm. L. Graul,
John H. Wogan.
Thos. J. Edge.

CEREAL CROPS.

I. Garretson,
N. F. Underwood,
E. W. Hale,
D. Wilson,
H. W. Kratz.
W. S. Roland,
M. W. Oliver,
G. Hiester,
H. M. Engle,
J. P. Barnes,
T. L. Clapp,
H. L. Scott,
R. S. Searle,
J. A. Gundy,
H. H. Colvin,
E. Reeder,
J. McDowell,
W. Gates.

SILK AND SILK CULTURE.

David Wilson,
J. D. Hicks,
J. A. Gundy.
J. A. Herr,
N. F. Underwood.
H. W. Kratz,
E. W. Hale,

ORNITHOLOGY.

Dr. B. H. Warren,
G. B. Sennet,
G. W. Thomas,
M. W. Oliver,
C. J. Pennock,
N. F. Underwood,
Thos. J. Edge.

FORESTS AND FORESTRY.

Wm. Gates,
N. F. Underwood,
R. S. Searle,
J. A. Herr,
W. S. Roland,
Thomas Meehan,
I. Garretson,
Chandlee Eves,
H. L. Scott.

APIARY.

M. W. Oliver,
I. Garretson,
W. Gates,
J. Shallcross,
H. H. Brown,
Arthur Todd,
Mrs. M. L. Thomas.
D. Videts,
W. A. McLean.

EXTRACT FROM AN ACT

To regulate the publication, binding and distribution of the public documents, approved April 16, 1887.

"Thirty-one thousand five hundred and ten copies of the work entitled the 'Agriculture of Pennsylvania,' in style, manner and form prescribed by law; eight thousand for the Senate, twenty thousand for the House of Representatives, one thousand five hundred for the Board of Agriculture, five hundred for the State Agricultural Society, five hundred for the Dairymen's Association, three hundred for the Fruit Growers', fifty for the State College, one hundred for the Governor, to be distributed by him, sixty for the Librarian for distribution and exchange with the States and Territories, and five hundred for reserve work."

EXTRACT FROM AN ACT

To authorize the printing and binding of the reports of the State Board of Agriculture, and other State agricultural reports.

SECTION 2. The matter for said volume shall be proportioned to the several organizations as follows: To the State Board of Agriculture, two hundred and fifty pages; to the State Agricultural Society, two hundred pages; to the State Dairymen's Association, one hundred pages; to the State Fruit Growers' Association, eighty pages, and to the State College, twenty pages, the whole volume not to contain more than six hundred and fifty pages: *Provided*, That each organization shall compile and arrange its own matter, and that no matter shall be used by either which is not original and legitimate to the organization offering the same.

SECTION 3. For the compilation, arranging and indexing of said matter, the sum of seven hundred and thirty dollars is hereby annually appropriated, to be paid out of any money in the treasury not otherwise appropriated, upon the receipt of the Superintendent of Public Printing and Binding, that all of the matter has been delivered to him; said sums to be divided as follows: To the State Agricultural Society, two hundred and fifty dollars; to the State Dairymen's Association, three hundred and fifty dollars, and to the State Fruit Growers' Association, one hundred and thirty dollars; and that each organization shall deliver the whole of its report in manuscript to the Superintendent of Public Printing and Binding on or before the first day of November of each year.

PROCEEDINGS

OF THE

PENNSYLVANIA STATE BOARD OF AGRICULTURE.

MINUTES OF THE WINTER MEETING.

Held at Lewisburg, Pa., December 7 and 8, 1887.

WEDNESDAY MORNING, *December 7, 1887.*

Board called to order at 10.30 A. M. by Governor J. A. Beaver in the chair.

John A. Gundy, resident member, welcomed the Board to Lewisburg, and was replied to on behalf of the Board by Governor J. A. Beaver.

On motion of Mr. Gundy the calling of the roll was postponed until the afternoon session.

The chair named Messrs. Roland, Wilson and Clapp a committee to receive and report upon the credentials of members-elect and delegates.

On motion of Mr. Eves the reading of the minutes of the Montrose meeting was dispensed with.

After a call of the standing committees, Mr. Engle, on behalf of the Committee on Poultry, and Mr. Herr, on behalf of the Committee on Cereal Crops, made reports for their respective committees.

On motion of Mr. Mather, the chair named Messrs. Roland, Engle and Herr to prepare and present to the annual meeting, resolutions relative to the death of Mr. Zerr, late member from Berks.

The Secretary presented a letter from Enoch Perrine, secretary of the Faculty of Bucknell University, inviting the Board to visit that institution. After discussion it was decided to accept the invitation and named 8.15 A. M. Thursday as the time for the visit.

On behalf of the Committee on Roads and Road Laws, Mr. Wilson read a report of that committee, which was accepted.

On motion adjourned until 1 30 P. M.

WEDNESDAY AFTERNOON, *December 7, 1887.*

Board called to order at 1.30 P. M. by Dr. W. S. Roland in the chair.

Present Hon. James A. Beaver, Dr. J. P. Edge and Messrs. Garretson, Herr, Eves, Oliver, Hiester, Wilson, Colvin, Engle, Barnes, Smith, Reeder, of Lycoming, Clapp, Hoffa, Speaker, Searle, Mather, Gundy, Gates, Bunnell, Roland and Secretary.

On motion, J. W. Mather read an essay on "The Best Way," and was followed by J. P. Barnes with an essay on "Public Roads."

Discussion on roads and road mending opened by Professor Wilson and participated in by Messrs. Wilson, Follmer, McKee, Searle, Reese, Engle, Smith, Gundy, Barnes and Secretary.

Hon. John A. Woodward then read an essay on "Farm Papers," and was followed by remarks by Dr. John P. Edge.

Dr. J. R. Loomis, LL. D., then addressed the Board on the Origin of mineral oils.

On motion adjourned until 7.30 P. M.

WEDNESDAY EVENING, *December 7, 1887.*

Board called to order at 7.30 P. M. to hear the lecture of Dr. James Calder, on Chinese Agriculture, and at the close of the lecture, adjourned until 9 A. M. Thursday morning.

THURSDAY MORNING, *December 8, 1887.*

Board called to order at 9 A. M. by Capt. M. W. Oliver, vice president, in the chair.

E. Shorkley read an essay on "Practical Methods of Purchasing and Using Commercial Fertilizers."

J. A. Gundy gave a full and complete account (illustrated by a chart) of his experiments in the application of different kinds of fertilizers.

J. K. Murray read an essay in reply to the question "Can Farming be Made Profitable?"

On motion the discussion of the fertilizers question was then opened and participated in by Messrs. Wilson, Gundy, Garretson, Nesbit, Woodward, Oliver, Searle, Bowery, Roland and Secretary.

Professor W. A. Buckhout then addressed the Board on "The Hessian Fly and its Enemies," and was followed by numerous questions which were fully answered.

On motion adjourned until 1.30 P. M.

THURSDAY AFTERNOON, *December 8, 1887.*

Board called to order at 1.30 P. M. by Capt. M. W. Oliver in the chair.

Dr. John P. Edge read an essay on "Artesian Wells as a Source of Pure Water for Farm Use." Discussion by Messrs. Gundy, Owens, Groff and others.

Professor G. G. Groff, of Bucknell University, then addressed the Board upon "The Reproduction of the Honey Bee," and illustrated his remarks by charts and diagrams. The address was followed by discussion on the part of Messrs. Young, Oliver, Engle and others.

R. A. Barber read an essay on "Growing Corn," which brought out considerable discussion.

An essay on "Fruit for Profit and Pleasure," was then read by G. Hiester. This was followed by an essay on "The Possibilities of Fruit Culture in Pennsylvania," by H. M. Engle, when, on motion, the discussion of the general question of fruit culture was opened and participated in by Messrs. Searle, Wilson, Herr, Woodward, Engle, Gundy, Colvin and Oliver.

On motion, adjourned until 7.30 P. M.

THURSDAY EVENING, *December 8th, 1887.*

Board called to order at 7.30 P. M. to hear a lecture on Lightning, by Dr. W. G. Owens, Professor of Natural History, Bucknell University.

Preceding the lecture Messrs. Searle, Bunnell and Gates, as a committee on resolutions, offered the following, which were unanimously adopted:

"*Resolved*, That the thanks of the Board are due to the county commissioners for the use of the court house in which to hold the meetings of the Board.

"*Resolved.* That the thanks of the Board are due and are hereby extended to the citizens of Lewisburg and the surrounding country for their attendance and valuable assistance in the proceedings of the meeting.

"*Resolved*, That our thanks are especially due to J. A. Gundy for his untiring efforts, which have made this meeting a success.

Adjourned to meet at Harrisburg, January 25th and 26th, 1888.

MINUTES OF THE ANNUAL MEETING.

Held at Harrisburg, Pa , January 25 and 26, 1888.

WEDNESDAY MORNING, *January 25 1888.*

Board called to order at 9.15 A. M., by Capt. M. W. Oliver, vice president, in the chair.

On motion of W. S. Roland, of York, seconded by Dr. J. P. Edge, the chair was authorized to name a committee on credentials of members elect and delegates. Chair named as said committee Messrs. Roland, Herr and Miller.

His Excellency Governor Beaver then took the chair and addressed the Board upon the subject of Forestry.

The regular order of the programme was then taken up and Dr. J. M. Anders read an essay upon "Forests as Sanitary Agents," and was followed by Prof. W. A. Buckhout, of the Pennsylvania State College, with an essay on "The Mountain Region of Central Pennsylvania and its relations to Forestry."

Prof- J. T. Rothrock, of the University of Pennsylvania, addressed the Board on the work of the Pennsylvania Forestry Association and was followed by Dr. E. E. Higbee, Superintendent of Public Schools, in an address on Arbor Day in the public schools.

The chair then declared the essays and address open to discussion and also that the general question of forestry was open for discussion which should be confined to its sanitary and economic bearings only.

Discussion participated in by Messrs. Wilson, A. O. Hiester, Oliver, Rothrock, Roland, Higbee, Lundy, Underwood. Searle, McCreary, Fernow, Anders, Kratz, Smith, McKeehan, Governor Beaver and Secretary.

On motion of the Secretary, the session was extended one-half hour, and the subject still further discussed by Messrs. Dr. J. P. Edge, Lundy, Meehan, Engle, Stitzel and Wilson.

On motion, adjourned until 2 P. M.

WEDNESDAY AFTERNOON, *January 25, 1888.*

Board called to order at 2 P. M., by Capt. M. W. Oliver, in the chair.

B. E. Fernow, Esq., of the Forestry Division of the United States Department of Agriculture, addressed the Board upon "The Forestry Legislation Practicable for Pennsylvania," and was followed by N. F. Underwood, member from Wayne, by an essay in answer to the question "Has the Destruction of Timber in Pennsylvania reached the Danger Line?"

Prof. E. J. James, of the University of Pennsylvania, addressed the Board upon "The Relation of the State to Forests," and was followed by Thos. Meehan, Botanist of the Board, in an address upon "Practical Forestry."

The chair then declared the legislative side of the forestry question open for discussion, which was participated in by Messrs. Oliver, Eby, Miller, Dr. J. P. Edge, Powell, Harvey, Gundy, Barnes, Meehan and Secretary.

On motion adjourned until 7.30 P. M.

WEDNESDAY EVENING, *January 25, 1888.*

Board called to order at 7.30 P. M., by Capt. M. W. Oliver, in the chair.

Committee on Credentials, through W. S. Roland, chairman, reported that they found that the following gentlemen had been elected by their respective societies as members of the Board, and in the opinion of the committee, were entitled to membership in the Board, viz: Columbia, Chandlee Eves; Lawrence, Samuel McCreary; Perry, F. M. McKeehan; Lycoming, P. Reeder; Juniata, David Wilson; Luzerne, J. B. Smith; Lackawanna, H. H. Colvin; Centre, E. W. Hale; Dauphin, G. Hiester; Berks, G. D. Stitzel; Cumberland, C. H. Mullin; Adams, I. Garretson; Northampton, A. D. Shimer.

They also reported that the following delegates were present with credentials:

Pennsylvania State Agricultural Society, Hon. A. O. Hiester; State Horticultural Association, Cyrus T. Fox, H. C. Snavley and H. S. Rupp; Warren County Farmers' Club, C. S. Stone; Grange No. 697, P. of H., John H. Epler; Lancaster County Agricultural Society, J. F. Whitmer and James Wood.

On motion, the report of the committee was accepted and the members elect declared entitled to seats in the Board.

The Secretary announced that vacancies existed in the representation of the counties of Schuylkill and Somerset, on account of the death of their representatives, and in the counties of Bedford, Butler, Lebanon and Sullivan, by non-election.

He also announced that Governor Beaver had appointed Col. James Young a member of the Board for three years ensuing.

Members present—Hon. James A. Beaver, Dr. E. E. Higbee, G. W. Atherton, Dr. J. P. Edge, Col. James Young, Will B. Powell and Messrs. Garretson, Stitzel, Reeder (of Bucks), Scott, Hale, Herr, Eves, Oliver, Mullin, Hiester, Harvey, Thornton, Wilson, Colvin, Engle, McCreary, Barnes, Smith, Reeder (of Lycoming), McKee, Kratz, Clapp, Hoffa, McKeehan, Searle, Gundy, Miller, McDowell, Bunnell, Roland and Secretary. Honorary officers present, Prof. Buckhout, Entomologist, Thomas Meehan, Botanist. and H. C. Demming, Stenographer.

The Chair named Messrs. Underwood and Barnes as tellers, and directed that the election of officers for 1888 be carried out in accordance with the programme.

Messrs. Oliver, Dr. Edge, Herr, Reeder, Barnes and Roland were nominated as vice presidents; after a ballot the tellers announced that Messrs. Edge and Herr had been elected, but that there was a tie vote as to the third Vice President; a second ballot having been ordered, the tellers declared W. S. Roland elected as third Vice President.

Messrs. McDowell, Hiester, Oliver, Reeder (of Bucks), Gundy, Garretson and Barnes, were nominated as members of the Executive Committee, and on motion of Mr. Herr, the Secretary was directed to cast the ballot of the Board for them.

Thos. J. Edge was nominated as Secretary, and the chairman directed to cast a ballot for him.

On motion of Dr. Roland, the Executive Committee were authorized to name the chairman of each standing committee and report the names at a subsequent session of the Board.

The Executive Committee was granted permission to meet during the sessions of the Board.

Mr. Hiester then read an obituary notice of J. G. Zerr, late member from Berks.

On behalf of the committee on resolutions, Dr. W. S. Roland presented the following appropriate resolutions of respect, of which the Secretary was directed to furnish a copy to the family of the deceased member:

WHEREAS, We have learned with sincere sorrow that death has removed from our midst our esteemed friend and late member, J. G. Zerr, of Berks; therefore, be it

Resolved, That in his death we recognize the hand of God, and bow in humble submission to his will.

Resolved, That this mournful event has deprived us of one whose intimate association and honorable character had won esteem and affection and who on all occasions proved to be a most worthy, efficient and energetic member of the Board of Agriculture.

Resolved, That we mourn the loss of our late fellow member and do most sincerely offer to the members of his bereaved family our condolence and sympathy in their great affliction.

Resolved, That the Secretary transmit a copy of these resolutions to the family of the deceased and that the same be recorded in the minutes of the Board.

(Signed) WM. S. ROLAND,
J. A. HERR,
H. M. ENGLE.

Remarks in reference to the death of Mr. Zerr were made by Messrs. Barnes, Stitzel, Searle, Roland and Wilson.

Reports of standing committees having been called for, Mr. McDowell, of Washington, on behalf of the committee on Wool and Textile Fibers, presented a full report which he illustrated by samples of the following kinds of wool, viz.: Wool tops, wool waste No. 1, wool waste No. 2, fine Australian wool, new clip unwashed Australian wool, Irish washed wool, East India washed wool, Mogadore washed wool, raw unmanufactured wool of commerce, camels' hair tops, camels' hair noils, East India carpet wool, and the best grades of carpet wool noils.

On motion of Mr. Herr, the Board then proceeded to fix the place of next meeting; Mr. McKee named Mercer; Mr. Stone named Warren; and Mr. Reeder (by request of Mr. Garretson) named Gettysburg; after discussion, Warren was selected as the place of next meeting, and the second week of June fixed as the time.

On behalf of the Pennsylvania State Agricultural Society, Mr. McDowell, of Washington, suggested that the State Board of Agriculture, the State Agriculture Society, the State Horticultural Association and the State Dairymen's Association, under the auspices of the State Board of Agriculture, should hold a joint Local Farmers' Institute at some time and place to be agreed upon by a joint committee of the four organizations.

After partial discussion, it was on motion of Mr. Roland, seconded by Mr. Kratz, resolved to appoint a committee of five to whom the invitation should be referred with directions to report as soon as practicable. The Chair named Messrs. Roland, Hale, Powell, Wilson and Oliver as the committee.

The Executive Committee reported the following appointments for which they asked the confirmation of the Board:

Advisory Committee, Messrs. Heister, Barnes, Gundy; they named the following as chairmen of the respective committees: Legislation, M. W. Oliver; Fruit and Fruit Culture, J. A. Herr; Forests and Forestry, Wm. Gates; Apiary, M. W. Oliver; Silk and Silk Culture, D. Wilson; Wool and Textile Fibers. J. McDowell; Roads and Road Laws, J. A. Gundy; Farm Implements and Machinery, P. Reeder; Cereal Crops, I. Garretson; Grasses and Fodder Crops, H. M. Engle; Dairy and Dairy Implements, E. Reeder; Ornithology, Dr. B. H. Warren; Poultry, J. Hoffa; Water Supply to Farm Buildings, R. S. Searle.

The committee also reported the names of the following honorary officers and recommended their confirmation by the Board, viz:

Botanist. Thomas Meehan, Germantown; Pomologist, C. T. Fox, Reading; Chemist, Dr. F. A. Genth, Philadelphia; Consulting Veterinary Surgeon, Dr. R. S. Huidekoper, Philadelphia; Veterinary Surgeon, Dr. F. Bridge, Philadelphia; Microscopists, Dr. H. Leffmann, Philadelphia, and Prof. C. B. Cochran, West Chester; Ornithologist, Dr. B. H. Warren, West Chester; Meteorologists, Prof. I. T. Osmond, State College, and J. L. Heacock, Quakertown; Mineralogist, Joseph Willcox, Philadelphia.

On motion the report of the committee was received and the appointments named by them declared made.

The committee to whom the resolution of Mr. McDowell relative to a joint convention of the different agricultural organizations of the State, reported as follows:

"While the State Board of Agriculture sympathizes deeply and earnestly with every organization aiming at the advancement of every department of agriculture in the State, and will do everything in its power to promote the success of the same, it does not feel authorized, under the law constituting it, to join in any such convention of different organizations under its auspices; it hereby cordially invites the State Agricultural Society, the State Horticultural Association, and the State Dairymen's Association, and any other association of kindred aims, to send delegates to any of its meetings."

(Signed) J. P. BARNES,
D. WILSON,
M. W. OLIVER,
E. W. HALE,
W. B. POWELL,
Committee.

After discussion the action upon the report of the committee was deferred until next meeting.

Adjourned until 9 A. M. Thursday morning.

THURSDAY MORNING, *January 26, 1888.*

Board called to order at 9.15 A. M , by Dr. J. P. Edge in the chair.

Mr. Wilson of Juniata, offered the following resolution, which, after discussion, was referred to the committee on Legislation:

Resolved, That in view of the expected revision of the tariff laws by the present Congress, our Senators and Representatives be requested to make a strong and earnest effort to have foreign raw silk cocoons coming into this country, tariffed at the same rate as the manufactured article, or at least to have the present tariff so modified as to enable the manufacturer in this country to pay the full value for home-raised cocoons.

The report of the Legislative Committee of the State Forestry Association was received, read and referred to the committee on Legislation.

H. M. Engle read an essay on "The Management of Milk and Milk Cows," and was followed by M. W. Oliver with an essay on "The Dairy—Then and Now."

John Hoffa read an essay on "The Advantages of the Creamery to the Farmer," and fully illustrated his essay by samples of milk of different values, showing the percentage of butter, whey and cheese in each. At the close of the essay the chair declared the general subject of the dairy open for general discussion, which was participated in by Messrs. Hoffa, Miller, Searle, Gundy, Roland, Oliver, Reeder (of Bucks), Underwood, Colvin, Wilson, Engle, Young, Harvey, Herr and Secretary.

(Governor Beaver here took the chair.)

Hon. John A. Woodward read an essay on "The Relation of the Public Schools to the Farmer."

Mr. Powell of Crawford, offered the following, which was unanimously adopted:

Resolved, That in view of the wide prevalence of a contagious form of tuberculosis among the dairy herds and other horned cattle of eastern Pennsylvania, a disease which renders both the flesh and milk product of the affected animal unhealthy or unsafe as food, this Board deems it expedient that the laws, both State and National, for the suppression of contagious pleuro-pneumonia, or cattle plague, should be promptly extended to cover the disease in question.

On motion adjourned until 2 P. M.

THURSDAY AFTERNOON, *January 26, 1888.*

Board called to order at 2 P. M., Dr. J. P. Edge in the chair.

Dr. E. Harvey, member from Delaware, addressed the Board in relation to "The Near Future of the Farming Interest."

On motion adjourned to meet at Warren during the second Monday in June.

During a session of the Board the Secretary presented his financial report as follows:

Total amount of all appropriations,	$5,750 00
Total amount of all expenditures,	3,405 02
Total amount yet available for all purposes,	$2,344 98
Appropriations for expenses of members,	$1,500 00
Amount expended for expenses of members,	901 82
Amount yet available for expenses of members,	$598 18
Amount appropriated for local farmers' institutes,	$3,000 00
Amount expended for farmers' institutes,	1,834 74
Amount yet available for farmers' institutes,	$1,165 26
Amount of appropriation for investigating diseases,	$500 00
Amount expended for investigating diseases,	337 46
Amount yet available for investigating diseases,	$162 54
Amount of appropriation for office expenses,	$750 00
Amount expended for office expenses,	331 00
Amount yet available for office expenses,	$419 00

The Secretary reported institutes and meetings as having been held as follows:

Bellefonte,	June 8th and 9th.
Montrose,	October 5th and 6th.
Montrose,	October 12th and 13th.
Mifflintown,	November 24th and 25th.
Newtown,	Nov. 30th and Dec. 1st.
Lewisburg,	December 7th and 8th.
New Castle,	December 20th and 21st.
Washington,	December 27th and 28th.
Mackeyville,	December 28th and 29th.
Millville,	January 11th, 12th and 13th.
Atglen,	January 19th and 20th.
Harrisburg,	January 25th and 26th.

He also reported that institutes would be held as follows:

Pottsgrove,	January 31st and Feb. 1st.
Lancaster,	February 1st and 2d.
Honesdale,	February 1st and 2d.
Gettysburg,	February 8th and 9th.
Oxford,	February 15th and 16th.
Hatboro',	February 22d and 23d.
Mifflinburg,	February 23d and 24th.
Tunkhannock,	Feb. 29th and March 1st.
York,	March 15th and 16th.

Other institutes have been partially arranged for, but no other dates had been fixed.

MINUTES OF THE SPRING MEETING.

Held at Warren, Pa., Tuesday, Wednesday and Thursday, June 12, 13 and 14, 1888.

TUESDAY EVENING, *June 12, 1888.*

Board met in the court-house at 7.30 P. M, to hear a lecture on "The Work and Workers of Pre-Historic America," by J. A. Gundy, member from Union.

Adjournd to meet at 9 A. M., Wednesday the 13th.

WEDNESDAY MORNING, *June 13, 1888.*

Board called to order at 9 A. M. by J. A. Herr, vice president, in the chair.

Roll of members called and the following answered to their names:

Dr. Geo. W. Atherton, President State College, Dr. John P. Edge of Chester, Will B. Powell of Crawford, I. Garretson of Adams, S. S. Diehl of Bedford, G. D. Stitzel of Berks, E. Reeder of Bucks, J. A. Herr of Clinton, Chandlee Eves of Columbia, J. C. Thornton of Erie, J. McCracken, Jr., of Jefferson, David Wilson of Juniata. H. M. Engle of Lancaster, S. McCreary of Lawrence, J. P. Barnes of Lehigh. J. B. Smith of Luzerne, C. R. Lantz of Lebanon, R. McKee of Mercer, H. W. Kratz of Montgomery, T. L. Clapp of Montour, John Hoffa of Northumberland, F. M. McKeehan of Perry, R. S. Searle of Susquehanna, J. A. Gundy of Union, Wm. Gates of Venango, F. R. Miller of Warren, J. McDowell of Washington, N. F. Underwood of Wayne, W. S. Roland of York, and Secretary.

The Secretary announced that owing to the unavoidable absence of Governor Beaver, who was detained by official business, the address of welcome and the reply would be postponed until afternoon, when it was expected that the Governor would be present.

On motion, the Chair named a committee on credentials, consisting of Messrs. Roland of York, Miller of Warren, and Garretson of Adams.

On motion, B. F. Morris of Warren, read an essay on "The Dignity of Labor."

The committee on credentials reported that Messrs. Diehl of Bedford, Shoener of Schuylkill, Lawrence of Sullivan and Lantz of Lebanon, were entitled to membership.

On behalf of the auditing committee Mr. Barnes reported as follows:

We the undersigned, members of the Executive Committee of the State Board of Agriculture of Pennsylvania, have examined the accounts of Thomas J. Edge, Secretary, for the fiscal year ending May 31, 1888, and find that he has received annual appropriations to the amount of $5,750, and has made disbursements as follows:

Expenses of members of the Board, ...	$1,582 44
Expenses of holding farmers' institutes, ...	3,023 24

Office expenses,	$732 99
Expenses of investigating disease of live stock,	420 23
	$5,758 90
Balance of last year's appropriation,	8 90
	$5,750 00

(Signed) J. P. Barnes,
G. Hiester,
J. A. Gundy.

On motion of Mr. Engle of Lancaster, seconded by Thornton of Erie, it was resolved that all discussion of essays be postponed until the programe for the morning session had been gone through with.

J. McCracken read an essay on "Farms the Stronghold of America," and was followed by Prof. S. R. Thompson with one on "The Acquirement of Manual Skill in Farming, with special reference to Farmers' Boys."

On motion, I. Garretson of Adams, read an essay on "The Education of Farmers' Boys."

On motion of Dr. Barnes, the reading of the last essay on the programme was postponed and the discussion opened on the essays read. Discussion participated in by Messrs. Barnes, Frear, Engle, Wilson, McCracken, Garretson and others.

On motion adjourned until 2 P. M.

Wednesday Afternoon, *June 13, 1888.*

Board called to order at 2 P. M. by Vice President J. A. Herr in the chair.

Prof. W. Frear, of the State College, spoke in answer to a question from the Question Box, and explained "What the State College was doing for the farmers' boys who were not at the college."

W. T. Everson of Union City addressed the Board on "The Past in Comparison with the Future Demands of the Dairy Interests," and was listened to with marked attention.

E. Reeder read an essay on "Butter Dairying in Eastern Pennsylvania," at the close of which the general discussion of the dairy question was opened and participated in by Messrs. Engle, Reeder, Gundy, Wilson, Everson, Barnes, Searle, Thompson, Samuelson, Edwards, Hoffa, Garretson and Secretary.

On motion of J. P. Barnes, S. H. Evans read an essay on "The Potato, its Origin and Soils best Adapted to its Cultivation."

Hon. C. W. Stone, Secretary of State, announced that he had received a telegram from the Governor stating that he had been delayed by a railroad accident and would be unable to reach Warren during the sessions of the Board.

Adjourned to meet at 7.30 P. M.

Wednesday Evening, *June 13, 1888.*

Board called to order at 8 P. M., by Dr. W. S. Roland, Vice President, in the chair.

On behalf of the Warren County Fair Association, the Warren Farmers' Club and the citizens of Warren, Rev. W. A. Rankin welcomed the Board in a few well-chosen words.

On behalf of the Board, Gen. W. S. Kirkpatrick, Attorney General, replied.

Dr. G. G. Groff, of Bucknell University, Lewisburg, Pa., then delivered a lecture on "Healthful Homes," which was listened to by a large and appreciative audience.

Adjourned to meet Thursday morning the 14th, at 9 A. M.

THURSDAY MORNING, *June 14, 1888.*

Board called to order at 9 A. M., by Vice President Roland, in the chair.

On motion, the Executive Committee was granted leave to meet during the sessions of the Board.

The Chair appointed a committee on resolutions consisting of Messrs. Underwood, Powell and Smith.

Geo. D. Stitzel read an essay on "Fruit Growing for Profit and Pleasure," when, on motion, all discussion was postponed until the programme for the morning had been completed.

Dr. B. H. Warren, Ornithologist of the Board, then addressed the meeting in relation to "The Sparrow Family," and fully illustrated his address by a large number of mounted specimens of birds.

C. R. Lantz, member from Lebanon, read an essay on "The Field and the Husbandman; or the Farmer and Farming of the Future."

On motion, the paper of Geo. D. Stitzel was declared open to discussion, which was participated in by Messrs. Powell, Stitzel, Everson, Garretson, Engle, Secretary, and others.

On motion, the final paper on the programme was postponed, and the Board adjourned until 1.30 P. M.

THURSDAY AFTERNOON, *June 14, 1888.*

Board called to order at 1.30 P. M., by Vice President J. A. Herr, in the chair.

On behalf of the Executive Committee, J. A. Gundy reported that the committee had decided to employ Dr. F. A. Genth as chemist for the term ending the fourth Wednesday in January next, and that in order to enable the Advisory Committee to properly assign local institutes they had decided that all applications for institutes should be filed with the Secretary of the Board at least sixty days before the date of holding the institute.

On motion of Mr. Gundy, it was agreed that hereafter when any essayist is not present with his essay in accordance with the printed programme, it will be assigned a place at the close of the programme for the same session.

On motion of Dr. Roland, it was resolved that all essays and addresses at day sessions be limited to one hour.

Questions from the Question Box were then referred and answered.

On motion of Mr. Garretson, the regular order of business, for fixing the time and place of the next meeting, was taken up, and Mr. Garretson named Gettysburg; Mr. McCracken named Brookville; Mr. Stitzel (on behalf of Mr. Lantz) named Lebanon; Mr. McCreary named New Castle; Mr. Clapp named Danville, and the Secretary named West Chester. A vote having been taken, it was demonstrated that no place had received a majority of the votes cast.

On motion, it was unanimously resolved that the next meeting be held at Lebanon, at a time to be fixed by the resident member and the Advisory Committee.

Prof. Frear stated that the corner stone of the new State Experiment Station building would be laid with appropriate ceremonies June 27th, and he invited the members of the Board to be present.

On motion of R. S. Searle, the question of the production of sorghum sugar in Pennsylvania was postponed until the next meeting, when he would be prepared to present the subject in full.

Mr. McKee, member from Mercer, read an essay on "The Advantages and Disadvantages of County Fairs," the subject-matter of which was discussed by Messrs. Smith, Oliver, Gundy, Stitzel, Lott, Searle, Herr, Roland, Garretson and Secretary.

On behalf of the committee on resolutions, Mr. Underwood, chairman, presented the following, which was unanimously adopted:

"*Resolved*, That the members of the State Board of Agriculture hereby return their most sincere thanks to the authorities of the borough of Warren, to the Warren Farmers' Club and to the Warren Fair Association, for the many attentions and courtesies extended to them during their meeting, and for the royal manner in which they have been entertained. To the committee of ladies who so skilfully and tastefully decorated the room in which the sessions have been held; to the commissioners of Warren county, for the use of the court house and committee rooms; to F. R. Miller, the resident member of the Board, and others, for the excellent arrangements made for our comfort and convenience; and to all, not members of the Board, who have contributed to the interest and value of the meeting by lectures, addresses and essays, and to the people of Warren borough and county for the interest manifested by their presence and the part which they have taken in the proceedings of the Board.

(Signed) "N. F. UNDERWOOD,
W. B. POWELL,
J. B. SMITH."

Will B. Powell presented the following resolution, which was unanimously adopted:

"*Resolved*, That Governor Beaver be requested to present the subject of the production of sorghum and beet sugar in Pennsylvania to the next Legislature, with such recommendations for its development and encouragement as the best interests of the Commonwealth demand."

M. W. Oliver, member from Crawford, then read an essay on "The Successes and Failures of the Apiary," the subject-matter of which was discussed by Messrs. McKeehan, Oliver, Groff, Evans and Smith.

On motion of Mr. Barnes, of Lehigh, adjourned to meet at Lebanon, October 17 and 18, 1888.

MINUTES OF THE AUTUMN MEETING.

Held at Lebanon, Pa., October 17th and 18th, 1888.

Board called to order at 10 A. M. by Vice President J. A. Herr in the chair.

On motion of Mr. Eves, roll-call and the reading of the minutes of the preceding meeting was postponed until the afternoon session.

An essay on the "Education of Farmers," by Joseph Painter, member from Armstrong, was read by Mr. Oliver.

On motion of Mr. Underwood, the chair named a committee on credentials, consisting of Messrs. Underwood, Smith and Stitzel.

An essay on the "Advantages of the Educated Farmer" was then read by John W. Harbeson, Esq., when on motion of Mr. Garretson, the essays of Messrs. Painter and Harbeson were declared opened for discussion, which was participated in by Messrs. Wilson, Reeder, Garretson Herr, Gundy, McKeehan, Lantz, Stitzel, Smith, Engle, Oliver and Secretary.

On motion, adjourned until 2 P. M.

WEDNESDAY AFTERNOON, *October 17th, 1888.*

Board called to order at 2 P. M. by Dr. John P. Edge in the chair.

Present Dr. Geo. W. Atherton, Dr. John P. Edge, Col. James Young and Messrs. Garretson of Adams, Stitzel of Berks, Reeder of Bucks, Scott of Bradford, Riddle of Butler, Herr of Clinton, Eves of Columbia, Oliver of Crawford, Harvey of Delaware, Wilson of Juniata, Engle of Lancaster, Lantz of Lebanon, Barnes of Lehigh, Smith of Luzerne, Clapp of Montour, Hoffa of Northumberland, McKeehan of Perry, Gundy of Union, McDowell of Washington, Underwood of Wayne, Roland of York, and Secretary.

On motion of Mr. Stitzel, of Berks, a question box was placed on the Secretary's desk.

On behalf of the committee on credentials, Mr. Underwood, chairman, reported that W. H. H. Riddle, of Butler, had presented a certificate of election which was not in proper form and that the committee recommended that the certificate as presented be received for this meeting and that Mr. Riddle should present to the Secretary a proper certificate. Report of committe adopted.

Isaac R. Hoffer, Esq., read an essay on "The Application of Geology to Agriculture," the subject matter of which was discussed by Messrs. Dr. Edge, Lantz, Gundy, Hoffa, Garretson, Underwood, Wilson and Smith.

On motion of Mr. Smith, of Luzerne, Henry M. Engle read an essay on "Farming—Past, Present and Future," which called out discussion by Messrs. Wilson, Engle, Harvey, Barnes, Gundy, Roland, Young, Oliver, Garretson, Herr and McDowell.

J. E. Daugherty, Esq., then read an essay on "Bees and Berries," which was followed by discussion from Messrs. Oliver, Daugherty, Harvey, Dr. Edge, Engle, McDowell and Barnes.

An essay on "Progressive Farming," by Oliver D. Schock, was then read by Mr. Oliver.

After referring and answering questions from the Secretary's table, adjourned to meet at 7.30 P. M.

WEDNESDAY EVENING, *October 17, 1888.*

On behalf the citizens of Lebanon and the Lebanon County Agricultural Society, Hon. P. L. Weimer, mayor of Lebanon, welcomed the Board as follows:

Ladies and Gentlemen: A few days ago I received a circular, or pogrammè rather, in which it is stated that the mayor is to deliver an address of welcome to the State Board of Agriculture. I wish you would take that programme, and strike out the word mayor and insert the word farmer, and that would enable me talk to you by the right of brotherhood.

I am glad to see that you have made this city your place of meeting; we are sadly in want of information. It may be startling to tell you that land is selling some at a dollar an acre, some at three, four and five dollars an acre, when you take away the fences and the buildings. It is far better for the young men to stay with us instead of going away.

I gentlemen, repeat, that we are glad that you who are authorities in farming have come here to hold your meeting, for we expect to benefit greatly by you; we expect you to shake up the dry bones. Therefore, gentlemen, with this prospect in view, we heartily welcome you to the city. You have a high mission to perform, to teach farmers to be contented with their homes. I hope we will all profit by your experience, and as our time is short I beg to introduce to you our most excellent Governor, the Governor of a peerless State, in which Lebanon is the peerless county.

On behalf of the Board, Hon. James A. Beaver, Governor and President of the Board, replied as follows:

Mr. Mayor, ladies and gentlemen: The fact which has been stated by the mayor is truly a startling one, that the farms of Lebanon county are selling for one, two and three dollars an acre, without the buildings and fences; and when you put it alongside of the other fact, that the prairie lands of Minnesota and Dakota are selling for ten dollars an acre, it becomes still more startling; and yet when you come to think about it, I believe, it is true. Take away from the farms of Lebanon county, the cost of the buildings and the cost of the fencing, and the other improvements that have been made upon them, and it is doubtful whether to-day, they would command in the open market, at an ordinary sale, more than the amount stated. We talk about the cheap lands of the west, and yet those cheap lands, in many places. unbroken prairies, are commanding ten dollars an acre—lands which are unbroken, the plow has not touched them, the hand of the mechanic has not erected a building, and the fence maker has not fenced them, and when all the advantages and conveniences which we have in our region, are added to them, it is doubtful whether they will not cost more than the farms of this locality. Whether that were true or not, it is nevertheless true that the farmer of Pennsylvania, who lives at home and enjoys the conveniences with which he is surrounded, with his comfortable house, with his good barn, with his comfortable out-houses, with his fruit trees and flower garden, and everything about him, which has come to him through the efforts of, perhaps, his forefathers, as well as himself, is better off to-day than the farmer of the west who starts in with the unbroken prairie at one dollar an acre; better off in everything that makes a farmer's life desirable and that makes it profitable.

But, and there is always a but to any human proposition, the farm of to-day in Pennsylvania, does not produce what it should in order to give seed to the sower, bread to the eater and profit to the farmer; and the question that presents itself to agriculture to-day is, what can we do to increase the profit of agriculture in Pennsylvania? And because that question has not been fully answered, is one of the reasons why the present depreciation of real estate exists to day; why is it, that the statement made by the mayor, that the farms of this rich valley are selling at one, two and three dollars per acre, when you take off the cost of the improvements, is true? I say that is one of the reasons this condition of affairs has been brought about.

I do not propose to give you the remedy. This State Board of Agriculture has been organized purely because this condition of things has been realized, and our most experienced farmers are brought together for the purpose of devising ways and means by which our agriculture may be diversified and its profits enlarged. And just in so far as the State Board of Agriculture solves this problem, its existence is justified and it will be continued.

The statement of the mayor has started two or three lines of thought in my mind, so that I very nearly forgot that we had been welcomed to Lebanon, and I was to respond to it. Not only your words of welcome, sir, and all this smiling welcome around us, gives us evidence that we are heartily welcome to the county, but this beautiful valley through which most of us have come, has smiled bounteously its welcome; your barns filled with plenty, your valley smiling with the verdure of the new crop of wheat and the second growth of clover, we come at a time when all nature smiles upon us and bids us welcome. There are not many localities in Pennsylvania which can give us such a royal welcome as here in Lebanon, the very center of one of our richest agricultural regions, and the very center, it seems to me, of practical agriculture, which ought to be made profitable, and which it is expected that we, in this session of the Board, will make more profitable by the instruction which the members of the Board will give to the farming community. We appreciate this welcome, not only of your words, but the evidence of your thrift which we see about us. We appreciate the welcome which this valley gives. I am sure that whilst the meeting of this Board here may in some measure tend to instruct your farmers, it will tend to the instruction of all of us; because it is true, that no matter how expert a farmer may be, he never goes to a new locality without learning something to his own advantage.

I doubt whether we can come to this valley, no matter how far advanced we may be in the science and art of agriculture, without adding something to our stock of knowledge and becoming better familiarized with our profession, with our avocation and better acquainted with our great State.

Now just as an illustration of that, there is a plate of apples, and I am told not one of the farmers present is able to tell what that apple is. If I am not very much mistaken in the look and color of it, and in the tinge of the rind, it produces what, to my mind, is one of the best apples in the world. And yet it is not that, but I suppose must be a cross of that variety with something else that is equally good.

Now, the discovery of a new apple, or the discovery of a good variety of apples, that is suited to our climate and will make a first-class apple for the table, is something that is worth coming to Lebanon for, even if there were nothing else in it. But these meetings are intended for mutual benefit and instruction. We come from a widely diversified soil and, to some extent, diversified climate. There is not a member of this Board who cannot add to the stock or knowledge that every other member has, coming from different localities, with diversity of soil and climate. We are able to teach each other something that we are all ready to learn, and something that we should learn.

Now let me start a little inquiry in this meeting for the future. I have lately visited the State Experiment Station in New York, at Geneva. Most of you know they have two stations, one maintained by the State entirely, and the other in connection with the Cornell University, in connection with the funds of that institution. I was at the station which is entirely maintained by the State of New York. I met its accomplished director, Dr. Peter Collier, late of the Department of Agriculture of Washington City. I was startled at the statement that he made upon a subject on which every thoughtful man must take a deep interest; and that was, in regard to sugar. Said he, "You and I will live to see the day when sugar will be manufactured at a profit and sold in this country at a cent a pound." I looked at the man in blank amazement; I thought of beet sugar, sugar cane and everything likely to produce such a result, and when he said sorghum, I began to think of all the difficulties we had here in Pennsylvania to get sugar out of sorghum cane, and yet as I sat down with him and went over the reasons which he gave, and as I looked at the products which he showed me of the sorghum cane, and looked over the fields, and saw some hundred and eighty different varieties growing on that Experiment Station, as I looked up in his office and saw the ripe grain hanging there, as I heard him tell that this sorghum seed was the food of a large portion of the human race, as I saw the flour which was made out of the ripened grain of the sorghum cane, which does not differ in any respect commercially from corn meal, except that it has one and a half percentage of starch in it, as I saw crystallized sugar made from the cane, as I saw in another department molasses made from the sorghum, as I saw finally a fine paper pulp used to make paper, and which was only second to the finest linen rags, and then as I heard him say that all these could be realized from the sorghum, even in our climate, I began to look more and more in amazement at the man, and I began to talk of the difficulties that we encounter, that we had never been able to crystallize sugar in Pennsylvania. "Of course not," he said, "you have cut your cane too soon. You take it for granted that it must be manipulated as sugar cane in Louisiana. Whenever the leaves commence to turn that is the time that the planter cuts it, and he does cut it, and you have been doing that. All you must do is to allow the grain to mature. The grain will pay the entire expense of the cultivation of the crop. It is just as good as corn, and makes just as good a yield. It will pay just as well as corn. You will get a hundred pounds from a ton of cane. You will get eleven gallons of molasses, and then you will have the cane to make into paper pulp, second only to the very best linen rags."

There he had them in a little box, covered with glass, all the result of the sugar-cane.

Then I came at him with the next difficulty. "Why," said I, "it will not mature; you cannot get it to mature." He simply pointed out the window. "Do you see that." There were acres of it that were matured, and here was the grain hanging in the office that had matured, and here were varieties in the box, and he told me they had one hundred and eighty varieties of the sorghum on the farm this year. The question as he put it was simply one of procuring the right sort of variety for planting in our northern climate. He showed me the white seed; he showed me the amber seed; he showed me, I suppose, twenty or thirty varieties, and some of these were such as would mature in the climate which is north of Pennsylvania, on the banks of Seneca lake.

I don't know whether Dr. Collier's statement can be verified. I don't pretend to say that everything he told me will be realized in our generation, but if the one hundredth part of it is true, we ought to be investigating that subject more fully than we are in Pennsylvania, for the sugar supply of this nation is the one great question of this generation. We are not furnishing our own sugar. We can furnish our own sugar, men say. If we can, we ought to do it, because America ought to raise everything that can be raised on American soil for our own market; and if Louisiana cannot furnish the sugar under the stimulus that has been given her during past years, and if the sugar industry does not thrive under that stimulus, then we must turn our hand to raising sugar either from the beet, sorghum cane, or some other product that will give us an adequate supply to furnish our own people with our own sugar. It has been done in other countries, it can be done in this cauntry, if we apply our knowledge and thought to the subject, and will consider it of sufficient importance to make a few experiments and expend a little money.

Dr. Collier pointed to New Jersey where experiments have been successful.

In Fort Scott, Kansas, the experiments for three years have been successful, and they are demonstrating there just what he alleges to be the fact, that when capital is invested in it, and our farmers are willing to raise the cane and become familiar with the plant and its habits, that sugar will be made at a profit of a cent a pound.

The doctor delivered an address on this subject a short time ago in New York. He gave me a copy of that address, and I amused myself by reading it; it was not amusement in the sense that I simply looked at it incredulously, because there are facts stated in it which it is pretty difficult for a man who believes in human testimony to reject. But I whiled away an hour or two in reading that pamphlet, and I am very sure that it would be profitable employment for any of us to get the very latest thought of the best experimenters on this subject. I speak of it now, because of what the mayor has said in reference to the low price of our lands, and the necessity of our diversifying our agriculture so as to increase its profits, and so as to give our people an opportunity to do something more with their lands than they are doing in raising wheat and the ordinary rotation of crops which we have.

This is not the time for a motion, and this is not the time to particularize any action in regard to what is suggested by these facts, or these apparent facts or these alleged facts, of which I have spoken; but it seems to me, that the State Board of Agriculture if they were to see this pamphlet, and if a majority of the members were to read it, and if they have faith in the statement of a man of culture and experience, a man who occupies a high station in our agriculture experimental work, if they would have faith in that, it seems to me that it would be a good thing to raise a special committee in this Board, who would investigate this matter and come to our next meeting with a report upon this question, based upon the experiments that have been carried out at Fort Scott, Kansas, and at the experiment station at Geneva, N. Y., and in New Jersey, and the Agriculture Department at Washington.

Perhaps you are all very familiar with this, and perhaps I am the only ignorant man in the Board of Agriculture, but I confess I was startled at some of the doctor's statements, in view of what I considered as settled, so far as Pennsylvania was concerned; because I thought we had about come to the conclusion that sorghum was not a crop that could be raised in Pennsylvania, that we could not mature cane, and when it was matured, we could not secure from it crystallized sugar.

Now, these things are domonstrated elsewhere; they are demonstrated north of us and west of us, and east of us, and I cannot see why Pennsylvania could not come in, in the experiments on this great question in regard to the supply of one of the prime products of modern necessity.

Now this is aside from a response to an address of welcome, and yet I confess that I do not attach very much importance to the ordinary form of response. It would be sufficient in response to your welcome for me to say, "We are very much obliged to you; we appreciate your welcome very much." I am sure if you watch the appetites of these farmers, as they surround your board to-night, you may be sure that your welcome is appreciated, if we don't say much about it, and it will be the best appreciation we can show—for I take it for granted that we are going to test the hospitality of Lebanon after while, and we will show our appreciation of its welcome by doing justice to a good old-fashioned Lebanon supper, which I am sure you are going to give us; and those of you who do not go to the supper will see by the morning papers, just how much these distinguished agriculturists have accepted and appreciated the welcome which has been tendered in words and which we shall experience in deeds.

We are certainly gratified in coming to Lebanon in seeing the undoubted evidences of thrift about us, and in seeing these products of your agriculture and your gardens spread out before us. This is, as I have said, one of the very best specimens of Pennsylvania agriculture that is around this thriving city; and it is a good thing for our Board to come into such communities as these, that their own knowledge may be increased and their zeal in agriculture may be stimulated.

We are grateful, sir, for your kindness and for the words in which you have addressed us.

Dr. Geo. W. Atherton, president of the Pennsylvania State College and of the State Commission on Industrial Education, then addressed the meeting on the subject of "Industrial Education, and its Methods at Home and Abroad. The address of Dr. Atherton was illustrated by samples from the industrial shops of the State College and by diagrams illustrating the industrial education of France, and was listened to by a large and appreciative audience.

THURSDAY MORNING, *October 18, 1888.*

Board called to order at 9 A. M. by Dr. John P. Edge, vice president in the chair.

On motion of Mr. Barnes, of Lehigh, the chair named a committee on resolutions consisting of Messrs. Barnes, Gundy and Smith, with instructions to report during the evening session.

Mr. Eves, of Columbia, offered the following resolution, which after discussion by Messrs. Eves, Lantz, Gundy, McDowell and Secretary, was referred to the Committee on Legislation for action and report:

"*Resolved*, That the Committee on Legislation be instructed to endeavor to procure an amendment to the law regulating the movement of traction engines on our public roads, so as to give greater security to ordinary travel, by making it a misdemeanor or penal offence for any one operating them to disregard the provisions of the law."

Mr. McDowell, of Washington, offered the following:

"WHEREAS, Suits are frequently brought against township supervisors of roads for damages claimed on the plea that the public highway was not of legal width or that steep banks were not protected by fences where such accidents occur; therefore,

"*Resolved*, That the Committee on Roads be instructed to report to the State Legislature an act for the better protection of the tax-payers of the townships of counties in this Commonwealth."

After discussion by Messrs. McDowel, Gundy, Harvey, Wilson, Dr. Edge, Engle and Secretary the resolution was referred to the Committee on Roads and Road Laws for action.

On motion of Mr. Garretson, of Adams, the regular programme was then taken up, and George W. Hays, Esq., read an essay on "Some of the Physical Relations Between Plants and Meteorological Phenomena."

Prof. John W. Græff read an essay on "Music Among Farmers," the subject matter of which was discussed by Messrs. Wilson, Engle, Daugherty, Lantz, McDowell, Oliver and Dr. Edge.

Prof. Cyrus Boyer then read an essay on "The Influence of Agricultural Fairs upon Education."

Cyrus T. Fox, secretary of the Berks County Agricultural Society, delivered an address on "Agricultural Societies and how to Interest Farmers in them," when, on motion of Mr. Eves, the general question of the management of agricultural societies was postponed until the afternoon session.

Dr. Roland offered the following, which was adopted:

Resolved, That the Board recommend the holding of another meeting in December, provided that the funds at command be sufficient, and that the time be fixed by the Advisory Committee.

On motion of Dr. Roland, of York, the question of holding another meeting was taken up. Mr. Garretson named Gettysburg as the place, and Mr. Hoffa (on behalf of Mr. Clapp) named Danville. A vote resulted in the choice of Gettysburg, and after discussion the question was referred to the Advisory Committee with instructions to call another meeting if in their judgment it was found advisable.

Mr. McDowell, on behalf of the Committee on Wool and Textile Fibers, reported that they had given the subject considerable attention and would report in due time.

Mr. Oliver, of Crawford, called the attention of the Board to the decision of the Venango county court, which was to the effect that the act of 1885 was unconstitutional.

Adjourned to meet at 1.30 P. M.

THURSDAY AFTERNOON, *October 18, 1888.*

Board called to order at 1.30 P. M. by Dr. John P. Edge, vice president, in the chair.

Hon. Cyrus R. Lantz informed that the Cornwall and Lebanon railroad had invited the Board to visit the celebrated Cornwall ore mines and that the company would furnish the necessary transportation at three o'clock. On motion of Mr. Smith, of Luzerne, the invitation was accepted, and 2.45 P. M. fixed as the hour of adjournment.

On motion of Mr. Barnes the question of the management of county fairs was then taken up and the discussion was participated in by Messrs. Harvey, Riddle, Roland, Underwood, Eves, Smith, Lantz, Stitzel, Engle, Scott, Reeder, Gundy, Oliver, Barnes, Fox and Secretary.

After the discussion and answering of sundry questions from the question box, adjourned until 7.30 P. M.

THURSDAY EVENING, *October 18, 1888.*

Board called to order at 7.30 P. M. by Dr. W. S. Roland, vice president, in the chair.

On behalf of the Committee on Legislation, Mr. Oliver, chairman, reported that they had taken into consideration the resolution offered by Mr. Wilson, of Juniata, at the annual meeting, and were of the opinion that it was inexpedient to take any action at the present time.

On behalf of the committee on resolutions, Mr. Barnes reported as follows:

WHEREAS, The State Board of Agriculture is about closing its sessions held at Lebanon the 17th and 18th of October, 1888, and as the local member, Hon. Cyrus R. Lantz, aided by a number of the enterprising and generous citizens of Lebanon have endeavored to make our stay among them pleasant, profitable and entertaining beyond the proportions usually extended and realized by our organization; therefore,

Resolved, That we hereby express our appreciation of this reception by the following resolution of thanks extended to the Hon. C. R. Lantz, for his indefatigable efforts in arranging and providing for the comfort and entertainment so heartily and effectually extended to the members of the Board. Also to Mrs. G. D. Coleman and Messrs. Nelson, Manning and Dace for the fine display of rare plants so liberally furnished for the decoration of the room, with such a pleasing effect to the eye. Also to the contributors of cereals displayed in the sheaf, and of vegetables, fruit and canned specimens shown. Also to Mayor Weimer and Messrs. Daugherty, Redsecker, Schenck, Snavely, Marks and other participating citizens for the complete and liberal bounties furnished to strengthen the inner man, and at the same time for the pleasant associations realized on that occasion. To the several essayists for their liberal, intelligent and profitable papers. To Robert Coleman, Esq., and to his efficient superintendent. Mr. Irish, for the kind and generous provision furnished to the members of the Board for visiting the noted Cornwall mines. To Prof. Graeff, the leader of the Lebanon band, for the music furnished for the enjoyment of members of the Board and those attending our sessions. And to the juvenile choir for the excellent vocal music furnished by them during the closing exercise of the meeting.

(Signed) J. P. BARNES,
J. A. GUNDY,
J. B. SMITH,
Committee.

Rev. T. E. Schmauck then addressed the meeting on "The Aesthetic and Moral Side of Rural Life," and was followed by Dr. E. Harvey, member from Delaware, on the subject of the "Mentality of the Inferior Animals."

Adjourned to meet at the call of the Advisory Committee.

EXTRACTS FROM THE REPORT OF THE SECRETARY.*

Meeting of the Board and Local Farmers' Institutes.

Under the provisions of the act of 1876, the Board was authorized to hold meetings of its members as often as it should direct and also to hold them in various portions of the State; the act of June 2, 1887, extended this power so as to authorize the Board to hold local or farmers' institutes in any part of the State, and the same act made an appropriation from which the actual and necessary expenses of these meetings should be paid; even before the act had received the sanction of the Legislature, applications were made for meetings, and before the season for holding them had arrived, the committee having the matter in charge had more applications than the funds would permit them to grant; in order to accommodate as many as possible, the average expenses of holding the meetings was limited to a sum which, in some cases, was insufficient to enable those directly in charge to carry out their original programme; in each case the best possible use was made of the funds thus granted and the result fully justifies the most sanguine expectations of those who advocated this plan of reaching the farmers of the State. Under the provisions of this act, local meetings have been held at the following points and dates:

Montrose, October 5 and 6.
Mifflintown, November 24 and 25.
Newtown, November 30 and December 1.
New Castle, December 20 and 21.
Washington, December 27 and 28.
Mackeyville, December 28 and 29.
Millville, January 11, 12 and 13.
Atglen, January 19 and 20.
Pottsgrove, January 31 and February 1.
Lancaster, February 1 and 2.
Honesdale, February 1 and 2.
Gettysburg, February 8 and 9.
Oxford, February 15 and 16.
Hatboro', February 22 and 23.
Mifflinburg, February 23 and 24.
Tunkhannock, February 29 and March 1.
Berwick, March 8 and 9.
York, March 15 and 16.

The attendance at the Honesdale meeting was very materially decreased by a severe storm which practically made the roads impassable, but with this single exception all of the local institutes were well attended, and in a number of cases the halls in which they were held failed to accommodate all who applied for admission; of the number given, four or five might be selected which far exceeded any former gathering of farmers in the same county, and taken as a whole the result may be considered as an indication of the approval of the farmers of the state, of the desire and intention of the Legislature and Board to benefit and assist them in their calling.

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*The extracts from the report of the Secretary, as here given represent some of the leading topics to which the office work of the Board has been directed; the limited space at command prevents the introduction of but a few of the main subjects and limits the report upon these to a concentrated form; numerous other subjects have been carefully investigated, a report upon which will be found in subsequent numbers of our quarterly reports.

In addition to the meetings above enumerated, the Board has held its regular meetings as follows:

Lewisburg, December 7 and 8.
Harrisburg, January 25 and 26.
Warren, June 12, 13 and 14.
Lebanon, October 17 and 18.

The result of the regular meetings has been fully up to that of former years and there is no indication that the holding of local institutes has in any way detracted from the interest in the regular meetings of the Board; the practical results of these meetings should encourage the Board to further efforts, and fully warrants the Legislature in granting an increased appropriation for the payment of "actual and necessary expenses" in holding them.

Annual and Quarterly Reports.

Each year's experience of the Board has shown that its facilities for placing its work before the public were entirely too limited and each year's accumulation of matter collected at meetings and institutes clearly proved that some outlet should be provided and some means taken for the preservation and publication of its work in such form as should render it available to the farmers of the State. The act of April 16, 1887, provides that there shall be published "thirty-one thousand five hundred and ten copies of the work entitled the Agriculture of Pennsylvania, in the style, manner and form prescribed by law; eight thousand for the Senate, twenty thousand for the House of Representatives, one thousand five hundred for the State Board of Agriculture, five hundred for the State Agricultural Society, five hundred for the State Dairymen's Association, five hundred for the State Horticultural Association, fifty for the State College, one hundred for the Governor, sixty for the State Librarian for distribution and exchange with States and Territories, and five hundred for reserve work."

By a previous act the Agriculture of Pennsylvania was limited to six hundred and fifty pages, of which two hundred and fifty were assigned to the State Board of Agriculture and the remainder proportioned among the other organizations named in the act of April 16, 1887.

Under the provisions of the act of April 1, 1887, the Board is authorized " To publish, in pamphlet form, quarterly reports of not more than one hundred and fifty pages, and not more than six thousand copies, of which two thousand shall be for the use of the members of the Senate, three thousand copies for the use of the members of the House of Representatives, and one thousand for the use of the State Board."

During the past year four of these quarterly reports have been published, each of the full size allowed by law, making a total publication by the Board of not less than one thousand pages of printed matter. A large portion of the quarterly reports has been given up to matter resulting from work at the local institutes; in order to give space for as much of this matter as possible, much of it was condensed and a portion carried over to the annual report. Even with this condensation a large amount of matter remains unused at the end of the year.

The acts providing for the distribution of both the annual and quarterly reports places by far the larger portion of them under the control of members of the Legislature, and the limited number allotted to the Board prevents us from responding to a large majority of requests for copies, which reach us from every State in the Union; the other organizations, the result of whose labors go to make up the report are in the same position and they are unable to furnish more than a small proportion of the number asked for by their correspondents.

The fact that the same matter has in one or two cases been duplicated in the reports of the different organizations, would lead to the inference that there should be some plan for regulating the character and kind of matter which is used, and that the publication of the work should be under the care of some responsible head; as now published at least four different indices are required for the annual report thus causing much confusion, which could all be avoided by a proper system in the publication of the report.

Diseases of Live Stock.

Ever since its organization, the Board has had charge of the investigation and prevention of diseases of live stock, and during nearly the whole period of its existence has had an appropriation from the Legislature for the actual and necessary expenses of the work; at different times the amount of this appropriation has been increased without a single negative vote and each year it has been found considerably short of that necessary to enable the Board to rightly perform the work entrusted to it. This limitation of funds has in a number of cases compelled the Secretary to decline to make the asked for investigations because he was not able to remunerate the surgeons for their work. In all cases, however, the officers of the Board have endeavored to expend the funds at their command without any partiality or unfairness, and to do so have divided the amount into four parts and so arranged the expenditure that each period should be sustained by its own proportion of the funds, and when this was exhausted work has necessarily ceased.

Under the provisions of the act of June 2, 1887, the Board is granted an appropriation for "The actual and necessary expenses of preventing the spread of disease among domestic animals;" while this provision would appear to confer all necessary power, yet cases have been found in which the action of the Secretary was hampered for the want of some more specific provision of law; the wording of the act clearly shows that the Legislature intended it to refer to contagious or infectious disease, for there would be no necessity to authorize the suppression of a disease not contagious. The recent experience obtained in suppressing an outbreak of glanders in Monroe county, proves the necessity for some special provision in existing laws or the passage of others, by which the manner in which diseases may be suppressed, shall be set forth so that there may be no difference of opinion between the two parties interested and so that the Secretary may have no difficulty in protecting the interests of both State and citizen. Such an act should specifically name the disease which is to receive the attention of the officers of the Board, and thus very much simplify the work and avoid all misunderstanding.

Common law and common justice would seem to have established the principle that when it becomes necessary to take the property of a citizen for the protection of surrounding property of a similar kind, that the State should in some way remunerate him for his loss. Hence such a law should plainly state the manner in which the proper amount of remuneration is to be ascertained and establish a maximum limit which cannot be exceeded.

The result of our experience with contagious pleuro-pneumonia shows that such a law should also, with proper restrictions, authorize the Secretary to accept the coöperation of the National Government in the suppression of disease. The National Bureau of Animal Industry can only assist the States by coöperation with their officers, the one furnishing the funds and the other the power, and any law for the suppression of disease of live stock should, in some way or other, provide for and authorize such coöperation. The law might very properly leave to the officers of the Board the arrangement of the details, but all such agreements should be subject to the endorsement of the Governor. That this can readily be accomplished has been demonstrated by the coöperation secured during the past year. That this can be extended to other disease, is also evident.

Contagious Pleuro-Pneumonia (Lung Plague).

Under the provisions of the act of May 1, 1879, the duty of suppressing contagious pleuro-pneumonia was assigned to the Governor; in view of the fact that the Secretary of the Board had always taken charge of all matters relating to the live stock of the State, Governor Hoyt commissioned him as his special agent to carry out the provisions of the act of 1879. Governors Pattison and Beaver have continued the Secretary in this line of duty, and as a natural consequence the work of suppressing the disease has been more or less intimately connected with that of the Board.

At numerous periods since the passage of the law our State has apparently been free from the disease only to be reinfected from an outside source; several attempts were made to secure the coöperation of the National Government so as to prevent the continued recurrence of this evil, but owing to the difficulty of harmonizing the action of National and State officers all such attempts failed. By a more recent national act the Bureau of Animal Industry was in posession of a considerable fund which was available for coöperation with the infected states, and New York and Maryland having arranged terms of coöperation satisfactory to all, and the cities of New York and Baltimore and their surrounding territory having been put under strict quarantine, it was believed that the most prominent sources of infection had been cut off, and negotiations for coöperation were again opened. By an agreement entered into by Governor Beaver and the Commissioner of Agriculture, the National Government agreed to assume all the expense provided the State would furnish the necessary power and commission the necessary officers. Under this agreement Governor Beaver, under date of March 21, 1888, issued his proclamation placing a district bounded by a curved line eight miles from the City Hall in Philadelphia, in quarantine, and placed the work of examination under the charge of the Secretary of the Board of Agriculture. Veterinary surgeons and assistants nominated by the Bureau of Animal Industry at Washington, were commissioned for the work, and proceeded to make a careful examination of every animal of the bovine kind within the specified district. Every animal was carefully examined, tagged and registered, and each owner was held personally responsible for all animals entered against his name on the books of the office. No animal was permitted to be taken out of enclosures unless accompanied by a proper permit signed by an authorized officer of the Department. No charge was made for permits or other services, and every precaution was taken to ensure the greatest possible liberty and the least possible inconvenience to the residents of the quarantined district. All herds found to contain infected animals were promptly condemned, and paid for by the National Bureau of Animal Industry, and in all cases the owners were apparently satisfied with the work done.

The right of examination in any and all portions of the State was extended to the employés of the Bureau of Animal Industry, but no cases of disease were found, thus proving the correctness of the statement which had been repeatedly made, that the extent of the disease in Pennsylvania had been very much magnified, and that in reality our State was much more nearly free from the disease than any of the infected states.

During the examinations made for cases of contagious pleuro-pneumonia, a careful record was kept of all cases of tuberculosis, and the uninitiated would be surprised at the extent to which tuberculosis (tubercular consumption) was found to prevail among the animals from which the milk supply of Philadelphia is drawn. The records of the National Department will show the exact number of cases found, and the necessity for a combined coöperative attack upon this disease is evident. It has been clearly demonstrated, at least so far as this State is concerned, that coöperation (in a practical manner) between State and National officers can rid the State of contagious pleuro-pneumonia, and what has been accomplished with this disease can be accomplished with other contagious diseases.

The work of suppressing any disease of live stock is one apparently within the duties of the National Government, but the fact that National officers can only exercise control over animals while actually in transit from one State to another, has heretofore prevented their action. By a proper form of coöperation by which the Bureau of Animal Industry can furnish the funds and the officers and the State can furnish the necessary power, the stamping out of glanders and tuberculosis is both possible and practicable, and the proper officers of the Board, with the approval of the Governor, should be empowered to arrange for and accept such terms of coöperation as the National Government may be able to offer.

Farm Wages and Farm Labor.

An investigation into the nature of the contracts for agriculture labor shows a growing disposition upon the part of the resident land owner to pay for the necessary labor by a fixed share of the crop, and with the non-resident owner to rent the land for a fixed money rent; the causes of this are numerous, but among the most potent are the following, the decreased profit to be derived from all crops, a division of risk in possible failures, and an increased interest in the crop upon the part of the laborer; with the non-resident owner the share plan partakes too much of the cat-and mouse nature to be either popular or satisfactory.

Contracts in which the pay of the laborer depends upon a share of the crop, vary very much with the crops produced, the location of the farm and the disposition made of the crops. In some cases the owner finds all teams, implements and seed, while the other party to the contract furnishes nothing but the labor and receives one-third of all crops produced; in some cases this is varied by the owner and laborer dividing the cost of grain for the teams, and only dividing the surplus crops. In many cases the laborer puts the grain into the half-bushel in the barn and in others delivers it at some marketable point agreed upon; in all cases he is usually paid for work done on the hay crop in which he has no special interest, and of which he receives no share; where cows are kept for milk or butter, other variations are often made to suit the convenience of both parties.

In addition to the direct money rent and a share of the crops we find the following plans on employing labor practiced in different portions of the State:

1. By the month or year for the whole year with constant work and all lost time deducted, the laborer being boarded and in some cases having his washing done in the family.
2. By the month for the whole year, the laborer to board himself, and to be found in constant work all the time.
3. By the month for the "summer months" only, with board when at work; in such cases the contract usually begins about the middle of March and terminate about the middle of November.
4. By the month for the "summer months," the laborer to board himself at all times.
5. By the day for such days as are fit to work out doors, the laborer to have board free when at work.
6. By the day when fit to work out (as in 5), the laborer to board himself.
7. By the day with board and with work at such time as his services may be needed; in some of these contracts a clause provides that the laborer shall have enough work to enable him to pay his rent in this way.
8. By the day during harvest at a special rate of wages, and with board.

In the table of "Farm wages and Farm labor," which is compiled from the reports of our official reporters, the reader will note that the variation in wages with and without board is not sufficient in amount to cover the actual cost of the board; this in most cases is made up by the fact that the farm hand who boards in the family is expected to be ready to do many "chores" which are not expected of the laborer who boards himself; the former is expected to gear and ungear teams at unusual hours, and to be on duty earlier and later than the hand who boards himself, and who usually begins work at sunrise and quits at sunset.

The average rate of wages per year with board is $12.90, while the average wages of the man who boards himself is $19.30, a difference of $6.40 per month, which will not pay for the cost of board; thus we find that upon nearly every farm upon which hired labor is employed, at least one man is hired by the year and boarded in the family.

The hours of labor are usually from "sun to sun," but this very much depends upon the location and upon the character of the farm produce; where milk is the leading commodity, it is necessary that milking be done at an early hour, in order that it may reach an early train for a distant market; where the surplus products of the farm are disposed of in the city markets, a similar condition exists, and hence in such cases it is usual to board the hands; much also depends upon the character of the employer, and this is taken into consideration by the employé when the contract is made.

By comparing the rate of wages by the whole year with the rate for the eight summer months we note that there is a difference of but three dollars per month in the two plans; this is due to the fact that for about four months during which he has little chance of obtaining work, the laborer has to board himself.

The average "cost of boarding a farm hand," as given by our official reporters is 34 cents per day, ar at the rate of $10.20 per month; when we compare this with the actual difference in rates with and without board, we find a balance of $3.00 per month, which would appear to be the value which the employer sets upon the extra labor of the hand who boards in the house.

From an average of all the reports from the different counties we obtain the following amounts:

Wages by the month, whole year, with board,	$12 90
Wages for the "summer months," with board,	16 35
By the day with regular work and board,	0 83
By the day with regular work, without board,	1 10
By the month, whole year, without board,	19 30
By the month, "summer months," without board,	22 86
By the day, for transient work, with board,	1 17
Harvest wages, with board,	1 46
Wages per week in the house for female help,	1 87
Estimated cost of board for farm hands per day,	0 34

Some of our correspondents note a great variation in the rate of wages paid in different parts of the same county, and attribute it to a growing disposition upon the part of the employer to make merit and ability an integer in the contract and to abolish the old plan of paying all about the same rate of wages: Some of our reporters note an increase in the number of hands hired under a contract to board themselves, and consider it a partial solution to the question involved in the great difficulty of obtaining proper help in the house.

Fence Laws.

At all of the meetings of the Board since its primary organization the question of a modification of our fence laws has claimed the attention of our members. Under the leadership of the late Mr. Beebe, of Venango, and of Hon. Geo. O. W. Hood, of Indiana, the subject had been presented to the Board in all of its many varied forms and it was fully decided that the changes which had taken place in agriculture since 1700 were such as would warrant the Board in asking the Legislature to so modify the principle involved in the laws relating to fencing as to reverse the interpretation given by the law of 1700, so that instead of the farmer fencing to keep the cattle of his neighbor out, he should fence for the sole purpose of restraining his own stock. The change in principle was so radical that when first presented to the Legislature it had very few supporters; at each session, aided by discussions at the Board meetings held in various parts of the State, it was noted that the principle involved was meeting with more favor until, under the championship of Hon. Geo. S. Criswell, of Venango, the Legislature of 1885 placed an act upon our statute books an act which was intended to permit each county to vote for or against the repeal of the act of 1700, and to make an affirmative vote equivalent to a repeal of that act so far as each county, so voting, was concerned. Under this act Venango county voted in favor of the repeal of the law of 1700, and a like action followed wherever the question was brought to a vote of the people; other counties had prepared to submit the question to a popular vote and in Lawrence county a vote had been ordered by the proper officers.

In January, 1888, in an action for damages done by cattle running at large, in the case of Frost *vs.* Cherry (County Court Reports, March 10, 1888, page 579), the court of Venango county declared the act of June 23, 1885, unconstitutional; later the Supreme Court affirmed the decision of the Venango county court, in an opinion handed down by Judge Paxson.

In the case of Frost *vs.* Cherry the questions raised by counsel were as follows:

1. Was the first section of the act of 1700 in force in Venango county at the time of its alleged repeal in pursuance of the act of June 23, 1885?
2. Is the said act of June 23, 1885, unconstitutional by reason of its being special or local legislation?
3. Is said act unconstitutional by reason of its delegation of the sovereign power to the people?

In referring to the first question raised by counsel, the judge thus defines the condition of the fence laws previous to the passage of the act of June 23, 1885:

"By the successful overthrow of the authority of the British Crown, all laws theretofore enacted under its authority, were abrogated, and on the 28th day of January, 1777, the General Assembly enacted the following statute: 'That each and every one of the laws or Acts of General Assembly that were in force and binding on the inhabitants of said province on the 14th day of May last, shall be in force and binding on the inhabitants of this State from and after the 10th day of February next, as fully and effectually to all intents and purposes as if said laws had been enacted by this Generl Assembly.'" During the seventy-six years which had elapsed between the enactment of 1700 and the 14th day of May, 1777, several acts relating to fences and strays had been passed. An examination of these acts shows that on the 14th day of May, 1777, the only part of the act of 1700 then in force was the first clause, which provides: "That all corn fields and grounds kept for enclosures within the said province and counties annexed shall be well fenced." The court, therefore, decided that all acts referring to fences had been repealed except the first clause of the act of 1700, and that this alone governed the fencing in all parts of the State, and he, therefore, rules as follows: "I am, therefore, of the opinion that the first clause of the act of 1700 requiring owners of improved lands to fence the same, was in force in this county."

In the case of Gregg *vs.* Gregg (Smith's Laws 5, page 230,) Justice Strong makes use of the following language, which shows that twenty years ago he foresaw the change that would probably be needed, for he says: "Our statute was made when all land was new, when it was more difficult to fence than now. It was more convenient to enclose cultivated fields than pastures. The land plowed and planted was of comparativly small extent, while the cattle were suffered to roam through unenclosed woodlands to obtain pasturage. These considerations may have induced the passage of the act of 1700. It is useless however to speculate upon this. It is enough that improved lands are required by law to be fenced and that it is the law that when it is the duty of the land owner to fence his land he cannot recover compensation for damage done to it by stray cattle so long as his duty is neglected."

So far as the consideration of the question affects our Board, we may assume that the whole State is governed by the first section of the act of 1700 and that the only modification of it is to be found in local laws relating to strays, under which all strays are kept off the public roads.

A general and full discussion of the subject at our Board meetings and at farmers' institutes clearly demonstrates the difficulty of framing any general law which will prove satisfactory to all sections of the State. As is indicated by our quotation from Justice Strong, the interest of any section depends entirely upon the proportions of improved and unimproved lands. The owners of improved lands are naturally opposed to any law which will compel them to fence it so as to restrain their stock within its limits; on the other hand owners of improved land desire protection from the stock of neighbors; the two interests are opposed to each other and the decision in any county or section, as was shown where a vote was taken on the act of June 23, 1885, depends upon which interest predominates.

The whole question reverts to the Board in its original form and it is presented in two distinct forms:

First. Can any general legislation be framed which will be sufficiently elastic to satisfy all sections and at the same time be within the limits of the Constitution?

Second. If so, what is its best form, and what shall be the language used?

In following up this discussion it should be distinctly remembered that all discussion as to the kind or character of the fence would appear to be out of place, as it is the duty of the fence viewers of each township to decide when a field is "well fenced." Acts subsequent to that of 1700 make it obligatory upon fence viewers to decide all questions in dispute as to the character of fences and damages done by estray stock, and the only question for the Board to decide is whether it will be best to advocate the entire repeal of the act of 1700, with a view to leaving the fence question under the comon law, or whether it will be best to endeavor to so modify the act of 1700 as to more nearly meet the requirements of our more thickly settled counties and at the same time not lose its applicability to counties in which unimproved land predominates.

The change produced by the entire repeal of the law of 1700 is a radical one, and it is a question whether the land owners of the State at large are ready for it; this can only be ascertained by submitting the question to the Legislature, and this can only be done by a general act repealing that of 1700; if the Board should decide that a modification of the law of 1700 will best suit the present needs of our land owners, then its Committee on Legislation should be instructed to prepare and present such an act to our Legislature.

Road Laws.

Under the championship of the late Mr. Beebe, of Venango, and others, the road laws of the Commonwealth have at various times been thoroughly discussed at our meetings, and in 1885 the discussions culminated in the drafting of an act which would permit the supervisors to collect a portion of the road tax in money; under previous acts every taxpayer could demand the privilege of working out the amount of his tax, thus depriving the supervisors of the privilege of purchasing improved machinery with which to keep the roads in repair. The introduction of labor-saving machinery of various kinds would enable those interested to very materially reduce the expenses of keeping the roads in repair, and at the same time place them in much better condition than was practicable under the old system of working out the taxes.

After a complete and thorough discussion of the question by the Board and a further investigation by its special committee on roads and road laws, it was decided to draft and present to the Legislature of 1887 an act which would enable the supervisors to collect twenty-five per cent. of the tax in money and to expend it in the purchase of scrapers and other necessary implements. The act of May 24, 1887, provides in the first section that road commissioners and others having charge of roads may purchase "plows, scrapers, road machines and other implements." And section second provides that "if necessary for payment for machinery, implements and materials mentioned, the supervisors, road commissioners, or other proper officers having in charge the opening, constructing and repairing of public roads of this Commonwealth, may, and they are hereby authorized, to collect annually, in cash, not exceeding twenty-five per centum of the rates or assessments by them respectively laid in each year for road purposes, such cash to be collected in the same manner that other road taxes not worked out are by law collected."

This provision has furnished the supervisors with a fixed fund from which payment could be made for implements, and at the Montrose meeting of the Board, the discussion of the question proved conclusively that the use of implements thus purchased had enabled supervisors to keep the roads in better repair, and in some instances to reduce the expenses fifty per cent.

In the counties of Montgomery, Chester and Delaware there exists among the taxpayers a strong desire for some provision of law which will enable the supervisors to permanently turnpike or macadamize a certain amount of road each year. The argument is that the amount now expended annually in temporary improvements would, if a portion was expended in permanent roads, in a few years place the roads of the township in much better condition without any increase in expense. It is proposed that the main and leading roads should be first permanently improved, and that after they have been completed the minor roads shall receive attention.

Legislation of this character has the same disadvantage as that referring to fencing, A road tax, for permanent improvement, which would be entirely satisfactory and proper in the counties named, would be oppressive and unnecessary in the more thinly settled counties. This is therefore an important question for the Board to consider in connection with that of a revision of the fence laws of the State, as the two plans will probably follow each other closely in their general outlines.

The act of May 24, 1887, does not make it obligatory upon road commissioners and supervisors to purchase labor-saving implements, but it makes it legal for them to do so if the people desire that it should be done. It would therefore seem practicable to enact that a certain proportion of the money collected for road taxes might be devoted to macadamizing and other permanent improvements. If this is made obligatory it would, in many counties, defeat the object of the provision, but in all cases it is safe to presume that the road officers would be governed by the will of the people of their district in any action they might take under such a provision.

The fact that such a law authorizes the expenditure of a certain percentage of the road taxes for permanent improvements does not make it obligatory upon the supervisors to expend that amount. The fact that they may expend one-fourth of the tax for the purpose of improved implements does not make it obligatory upon them to do so, and in the same manner by the proper provision of the law, the people of the district would, within certain limits, decide as to how much should be used for each purpose.

The general principle involved is briefly this: That in the case of many of the worst parts of township roads a sufficient sum to permanently improve them is expended in temporary repairs every ten years, and at the end of that time they are in no better condition than at the commencement. It would seem that this is an eminently proper question for the Road Committee of the Board to take into consideration.

Movement of Traction Engines.

The introduction of steam for thrashing and the convenience of traction engines as combining power for driving the thrasher and for moving the machinery from farm to farm, has led to a frequent appearance of this kind of machinery on our public roads. In most cases it has been found difficult to drive ordinary farm horses past such engines. The Legislature of 1885 was presented with a draft of an act intended to give greater security to persons passing along our public roads, but to a certain extent it has failed in its purpose. The second section provides "That in every case when such machinery propelled by steam is being moved upon a public road or highway it shall be the duty of the owner or owners in charge of such machinery, upon the approach, in either direction, of all persons traveling in vehicles or in charge of teams, to move such machinery as far as practicable to the right or left of the road to a position where the said approaching vehicle or team may pass with the greatest safety, and stop the same before such persons traveling in vehicles or in charge of teams shall have arrived within three hundred feet of such machinery, shall assist such passing vehicle or teams until they are safely by the danger, and if there be any obstruction to the view of the road it shall be the duty of the owner or owners or persons in charge of such machinery not to approach such obstruction nearer than three hundred feet without going to the place to see that the road is clear, or sending some competent person for the purpose."

At the recent meeting of the Board attention was called to cases wherein the parties in charge of traction engines has neglected or refused to comply with the provisions of the law above quoted, and cases were stated in which damage had been done to carriages by this disregard of the plain provisions of the law. The defect which appears to need a remedy is that there is no special penalty attached to a violation of the law. The party in charge, in many cases, is an irresponsible person, and the theory that he can, under common law, be held personally responsible for all damages, does not hold good and is of no value to the damaged party.

If a disobedience of the provisions of the second section of the law was made a misdemeanor, the difficulty would, in a great measure, be removed, as in that case both the owner and the party in charge would be liable to punishment.

The attention of the Board has also been called to the fact that in several cases bridges have been broken down by traction engines and the damage not reported so that repairs might be made to prevent damages to teams following. It would seem that inasmuch as the act of June 30, 1885, practically legalizes the passage of traction engines along the public roads, that it necessarily becomes obligatory upon supervisors and road commissioners to so construct or repair all bridges as to support the additional weight, and it is questionable whether any further legislation is needed to protect the public in this direction. The question is, however, one which might very properly come under the consideration of the Committee on Legislation.

Maintaining and Increasing Fertility.

The work of the farmer consists of a series of attempts to transfer the fertility of his soil into marketable products, and he is the most successful farmer who can make this transfer with the greatest amount of profit or with the widest margin between the actual value of the fertility on the one hand, and the market value of the crop or product upon the other. It is by far too common a habit among farmers to estimate the cost of a crop or product at the value of the manure or fertilizer, plus the cost of labor, entirely losing sight of the fact that every bushel of grain, quart of milk, pound of butter, beef or mutton, contains a certain amount of soil fertility which is just as much a portion of the producer's capital as are his implements, teams and live stock, and which, like the latter, has its fixed market value.

To fully appreciate the problem of increasing or maintaining fertility we must learn to regard every product sold off the farm, not as so much by weight or measure, but as representing just so much fertility coming directly from the soil. On the other hand we must regard every load of manure or ton of fertilizer as representing a certain amount of similar fertility. Viewed in this light we must bear in mind the fact that one hundred dollars worth of wheat sold off the farm takes with it twenty dollars worth of fortility; that each horse grown to full maturity and sold off the farm takes with him seven dollars worth of the fertility of that farm; that the sale of one hundred dollars worth of butter (the skim milk being retained and fed on the farm) removes but twenty-five *cents* worth of fertility, and that the amount of soil fertility removed in this way will depend upon the character of the crop, varying from its minimum in butter to its maximum in tobacco.

On the other hand we find that wheat bran if fed on the farm to cows producing butter (the skim milk remaining on the farm), fully eighty per cent of its manurial value (fertility) remains on the farm; that one ton of bran, in addition to its food value, contains about twelve dollars worth of fertility, which, owing to a loss alluded to hereafter, nets the farm about eight dollars worth of "returned fertility," and that what is true in relation to bran is also true to a greater or less degree in relation to all food products consumed on the farm. We must therefore credit a ton of hay or bran not only with its actual food value but also with its fair share of returned fertility, the amount of which is dependent upon the kind of stock to which it is fed and the use to which the product from the stock is directed, *and upon the care which is taken of the resulting manure.*

For a permanent increase in the fertility of a farm we have three plans open to us, and the economy of the result depends greatly upon our choice of the mode; and a choice which will be prudent and economical in one case may prove suicidal in another; it is in this choice of modes of increasing soil fertility that in very many cases, constitutes the difference between the successful and unsuccessful farmer.

We, may by the use of lime or the growing of deep rooted plants to be turned under, obtain from the subsoil its reserve plant food, or we may, by the use of lime, render soluble and available the inert mineral matter already in our soil; or we may by the purchase and feeding of grain, transfer the fertility of other farms to our own; or, by the purchase of commercial fertilizers, we may accomplish the same result in a more direct way. To be able to select that plan which in his particular case is the most economical is the true mark of the successful farmer. The answer to the problem must in great measure depend upon location, surroundings and the nature of the products produced.

If the practical dairymen of eastern Pennsylvania, who obtain an extra price for their butter, are asked the question, they will invariable reply that it is best to but on more cows, buy more feed, and produce more butter; this is due to the fact that in the extra price obtained for their butter they have an additional chance for profit, and one which very often draws the line between profit and loss. The same reasoning will not apply to the farmer who, in the interior of the state, is forced to depend upon a market for his grain and hay in the shape of beef or mutton, or in the production of live stock; in most cases he works upon a very narrow margin and is unable to produce a special article which will command special prices; to him the problem has another significance and he must adopt one or the other of the remaining two plans; in very many cases he finds himself compelled to give his hay and labor for the manure, depending upon the increase in weight to pay for other items

In adopting either of these plans we must bear in mind the important fact that all transfer of food products of any kind is attended with more or less loss of soil fertility, but that the proportion of loss is dependent upon the dexterity with which the transfer is made. Scientists estimate that with the best care there is a loss of about twenty per cent. between the feed and the application and utilization of the manure, if this percentage of loss is met with under favorable circumstances, what is the percentage lost by a passage through the average Pennsylvania barnyard? If of the original twelve dollars worth of "returned fertility" in a ton of bran we have it reduced to but ten dollars, the possibility is that in average practice it is reduced to but eight dollars or even less.

A noted English scientific experimenter, who has done much for the cause of agriculture, and whose conclusions are accepted as correct, is credited with the assertion, in effect, that there was no such thing as a *profitable* increase of fertility, and that no farm could be permanently improved from sources within its limits. If these statements are correct from the standpoint from which they were made, but there are many Pennsylvania farmers who will be disposed to accept them with considerable doubt; it is true that the farmer who by the use of lime and deep rooted crops increases the fertility of his surface soil at the expense of his subsoil, does not increase the fertility of his farm from a source within its limits, yet he increases his stock of available fertility which, for his purpose, amounts to the same thing; it may be possible that he who increases his farm by the use of commercial fertilizers may (when the average is taken) fail to do so profitably, yet that there are many who have thus obtained an increase of fertility profitably cannot be doubted, and what one has accomplished another may also do. It is true that since the completion of creation no actual fertility has been formed, yet we firmly believe that much that now exists can be profitably transferred from the concentrations in the phosphate beds of South Carolina and the islands of the South Pacific to Pennsylvania farms, and that this transfer may be so made that the resulting crops will repay double the actual cost.

If, then, the purchase of fertility is governed by the same laws as govern the acquirement of any valuable property, it is important that the practical farmer should make the best selection, and that he should not purchase material for which he has no profitable or immediate use.

The practice of feeding upon the farm all that it produces does not necessarily lead to any increase in soil fertility; all that is valuable of soil fertility in the crop came from the farm, and there may have been no increase in its amount; the chances are that in the transfer there may have been, at least so far as the fields are concerned, a loss; and it is also probable that at each transfer there may be a loss; to keep this loss at a minimum is the object of all successful farmers, and usually he is the most successful who, in this way, loses the least.

With our present knowledge of chemistry, and with the present value of commercial fertilizers, it is evident that an increase in fertility is merely a question of dollars and cents; that by the purchase of this kind of fertility a farm may be increased in productive ability is undoubted, but the great difficulty is to accomplish this without a loss of capital; the addition of the fertility is not difficult, but its profitable transfer into products is the rock upon which many an agricultural craft suffers shipwreck. If more is paid for fertility than is obtained for it when sold, a loss must surely follow, and a change of plan or bankruptcy are only questions of time.

The Condition of the Fertilizer Trade.

The analyses made by the chemist of the Board during the past fall demonstrate that manufacturers have narrowed the margin between "selling price at the point of selection" and the "comparative commercial value;" in former years our fertilizer analyses lists have shown that the goods made for the Pennsylvania trade have been of a higher quality than those of other States; this has been largely due to the action of our fertilizer law which excludes low grade goods and encourages the introduction of those of good quality; the fact that our law does not fix a minimum amount of the different component parts, has also had much to do with the excellent quality of our fertilizers. During the season of 1888 all kinds of fertilizer supplies advanced in price, in some case to the extent of nearly two dollars per ton ; the prices, owing to close competition had been reduced until it was difficult to see how a profit was obtained; the advance in the price of supplies, if the former quality was adhered to, would have more than absorbed the margin for profit; sooner than increase the price, the manufacturers lowered the grade of the goods; the analyses of former years show that there was in most cases a considerable difference between the analysis as found by our chemist and that guaranteed and recorded by the manufacturer; in many cases this difference amounted to two or three per cent. in phosphoric acid (available) and to rather less in potash and about half that amount in ammonia.

By narrowing this margin the manufacturers have secured the same result as would have been attained by an increase in the price, and the consumer has been placed in exactly the same position that he would have occupied had the prices been raised ; one furnishes less that he did and the other receives less than formerly. It will however be noted from our published list of analyses that the consumer has still a good margin in his favor and that while the standard has been lowered, the goods are fully up to the guaranteed analysis and in many cases above it.

One of the worst features at present observable in the fertilizer trade is the growing disposition on the part of manufacturers to give their brands names which are evidently intended to mislead the consumer and to give him the impression that he is obtaining his fertilizers from a source supposed to be better than the one from which they actually came. Thus ordinary Acidulated South Carolina rock is branded Soluble Bone Phosphate and in too many cases a second and lower grade is made and branded with its true name of Dissolved South Carolina rock. Many pure bone phosphates (so called) do not contain a particle of bone (as the consumer understands the term) and numerous guanos (so called) have no relation to the natural product so long known under that name. The fact that available phosphoric acid from South Carolina rock has the same actual value as that from animal bone, is no excuse for the palpable misrepresentation ; many consumers prefer fertilizers which derive their phosphoric acid from animal bone and have the right to obtain goods in this form if they so wish.

A noticeable feature, caused no doubt by the increase in the price of fertilizer materials, is that when they are used in mixed fertilizers the Acidulated South Carolina rock has not been as completely dissolvted as formerly and that there is therefore a larger proportion of insoluble phosphoric acid to be found in them ; the introduction of a high grade article furnishing phosphoric acid in a reverted form, has, in many cases, greatly increased the showing in the column for this class of phosphoric acid, and proportionately decreased that showing the soluble; inasmuch as chemists claim that these two forms (when ranked as "available") have equal values, the consumer does not probably suffer from the substitution, except that this grade is very often found in the "Pure Bone" fertilizers, when by the greatest stretch of scientific argument it can hardly be said to contain a particle of animal bone.

A number of manufactures who claim that they do not use a single ounce of rock in the preparation of their fertilizers have complained that those who do use this article place the same brand upon their goods and dispose of them at the same prices. To avoid this difficulty the laws of some of the States provide that the analyses on the sacks shall show the source from which each ingredient is obtained; so far as we have been able to examine, this provision is practically evaded and the same condition of affairs exists as in States having no such provision.

Our analyses lists show that during the past year three or four fertilizers of very low grade have been offered for sale in the State; in all such cases, when the analysis found by our chemist is below that guaranteed by the manufacture he has been notified to at once withdraw the goods from sale and either rebag or rebrand them; the appearance of these low grade analyses at different points on our list, should not be taken as an index of the amount sold; in all cases where such goods have been found by our agents they have been followed up and by repeated analysis we have endeavored to put the consumer upon his guard against them. The law permits the manufacturer to make them as poor and of as low a grade as may suit his convenience, but having once established his analysis and placed it upon record in the office of the Board, he must keep his goods up to it or run the risk of a suit for damages under the act of June 28, 1879. In three such cases the goods have been temporarily withdrawn from the market and rebranded to suit the analysis as found by our chemist; this protects the consumer and carries out the intent of the law. It is perhaps but simple justice to state that every such case found this season has been the result of a want of knowledge of chemical analysis and of the ingredients made use of, and not from an intent to defraud the consumer. In one case the uneven character of the ingredients used deceived the manufacturer and the sample drawn to establish the guaranteed analysis being of the best quality, the error was committed without actual intent to defraud.

Does Chemical Analyses furnish the Purchaser 'of Chemical Fertilizers with a Safe Test of their value ?

During the existence of the Board this query has come to us in a great variety of forms, and from an equal variety of sources, but it comes with the greatest frequency from manufacturers whose goods have failed to stand the test which chemical analyses imposes, and which have been shown to be below the proper grade as established by the price at which they are sold. In some cases it comes to us from manufacturers of fertilizers whom we know buy all of their fertilizer supplies by this test alone, and who demand from the seller a drawback for every fraction of a per cent. which analysis shows below the agreed-upon price. In some cases it comes to us from a bewildered consumer who has been puzzled by the words and slippery argument of the fertilizer agent, who has endeavored to cover up the fact that the fertilizer which he represents has not been able to stand the test imposed by law; but in either case our answer is the same and in the affirmative.

Chemistry, properly understood and carried out, is an "exact science," and not subject to errors as is a test in the field; the latter is influenced by rainfall, sunshine, soil and sundry other causes over which neither manufacturer or consumer can exercise an influence; the result in the laboratory is governed by known and exact laws, and is not in any way influenced by causes not under the control of the chemist. In former years differences in results could be clearly traced to differences in practice, but since the perfection of the National organization of chemists and the adoption of universal methods, these differences have been reduced to a minimum, and even where different methods are used, the perfection of these (in experienced hands) has also reduced the ratio of variation to a very low point, and we may now accept the results of leading chemists as conclusive.

During the year 1881 the Secretary of the Board carefully divided a sample of Acidulated South Carolina rock between six of the leading chemists of the eastern States. Special care was taken to secure a uniform sample, and none of those to whom it was sent were allowed to know that a test was in progress; the results in total phosphoric acid were as follows:

No. 1, ...	16 32 per cent.	No. 4, ...	16.37 per cent.
No. 2, ...	16.34 per cent.	No. 5, ...	16.33 per cent.
No. 3, ...	16.39 per cent.	No. 6, ...	16.00 per cent.

In this case the extreme variation did not amount to eight pounds of phosphoric acid, and would have affected the valuation less than forty cents per ton.

Still more recently a sample was similarly divided among six of our most noted chemists; to one, two samples were sent with a request that he should test them by both of the more common methods of analyses. The result in available phosphoric acid was as follows:

No. 1, ...	14.31 per cent.	No. 4, ...	14.48 per cent.
No. 2, ...	14.34 per cent.	No. 5, ...	14.56 per cent.
No. 3, ...	14.83 per cent.	No. 6, ...	14.64 per cent.

No. 5, to whom two samples were sent, he not knowing that they were identical, gave the result by one method as 14.64, and by the other as 14.66.

As with all other scientific operations, much depends upon the character of the scientists who have the matter in hand, and in chemistry, as in other things, it is safest to employ only the best; the same sample as given in the first case was also given to three ameteurs who returned results varying considerable from those given above, and which, if accepted as evidence, would have destroyed the correctness of the test.

It may be accepted as a remarkable coincidence that the manufacturer who (in the experience of the Secretary of the Board) cavils most at the correctness of analytical work, invariably purchases all of his fertilizers supplies (as does every other manufacturer of any prominence) upon the "unit" plan or by guaranteed analysis, first by his own chemist, and, in case of dispute, verified by a named leading chemist who is included in the two tests which we have given. A plan which has universally been proven to be safe for the manufacturer should be as safe for the consumer, and equally applicable to his wants.

Sources of Phosphoric Acid.

Thirty years of practical field experiments have clearly proven that of the three elements usually found in a commercial fertilizer, available phosphoric acid is the one which suits all soils and all crops; and that while potash is needed by certain crops and certain soils, all respond to an application of phosphoric acid; and that in very many cases Acidulated South Carolina rock (available phosphoric acid only) produces quite as good effects as a complet fertilizer containing all three elements. This being the case, a consideration of the sources from which this important supply of fertility can be drawn becomes important.

Many of our readers can readily remember the first introduction of "phosphate," when the term meant ground raw bone treated with sulphuric acid, and when no other source of phosphoric acid (for agricultural purposes) was known. Quite early in its application, the writer well remembers the question of the extent of the supply and its probable exhaustion being discussed. The application of phosphoric acid was made in one of two forms: either as ground raw bone or as raw bone treated with acid; with both the total effect was the same, the only thing gained by the addition of the acid, being quicker action, and of course quicker exhaustion. If immediate effect was wanted the bone and acid (phosphate) was used, but if the nature of the crop was such as to enable it to be properly utilized pure raw bone it was preferred. When first introduced the acidulated bone was made pure, but ere long adulterations crept in and the grade and price were gradually reduced, until the effect ceased to pay for the outlay; marl, coal dust and other cheap material was used upon the plea of furnishing other elements necessary for plant growth and a low grade of "phosphate" was made; as a natural result farmers either gave up the use of fertilizers or applied the bone untreated with acid.

A pure article of acidulated bone should give from eleven to fourteen per cent. of available phosphoric acid, depending somewhat upon the amount of acid used and the completeness of the admixture.

The next source of phosphoric acid discovered was the celebrated phosphate beds of the Ashley and Cooper rivers in South Carolina, and the introduction of an article since known to the trade as South Carolina rock. Without going minutely into the history of its discovery or taking any part in the discussion as to its origin, it is sufficient for the purposes of this paper to state that an average sample will show about the following analysis:

Phosphate of lime,	64 to 69	per cent.
Carbonate of lime,	5 to 7	per cent.
Sand and insoluble matter,	11 to 12	per cent.
Organic matter,	7 to 8	per cent.
Alkaline salts, potash and soda,	2 to 3	per cent.
Sulphate of lime,	2 to 2½	per cent.
Oxide of iron and alumina,	2 to 2½	per cent.

When thoroughly pulverized and treated with sulphuric acid, the insoluble phosphoric, by a change in its combination with the lime, is converted into soluble and reverted, which taken under one head, are known as available phosphoric acid; the average sample, if properly incorporated with sulphuric and allowed to lay long enough for the change in combination to take place should show about the following analysis:

Soluble phosphoric acid,	9½ to 11	per cent.
Reverted phosphoric acid,	3 to 5	per cent.
Insoluble phosphoric acid,	1 to 3	per cent.

Thus showing an average of from 12 to 16 per cent. of available phosphoric acid; in our analyses we have found samples made from unusually rich rock to run over 17 per cent., but these are unusual and far above an average. If an insufficient amount of sulphuric acid is used, or if the manipulation has not been complete and perfect, the percentage of insoluble will run high and that of available proportionately low; in some of the State analysis the percentage of insoluble has run as low as one-half of one per cent., showing an excellent manipulation; if too much acid (and water) is used, the mixture is too wet to drill nicely.

In the phosphate beds of South Carolina the "rock" is found in three conditions or positions, viz.: In the form of an apparently regular layer; in the form of distinct lumps or nodules scattered through the soil and mixed with marl, and in the form of nearly round nodules or lumps imbedded in stiff blue clay. In referring to these three formations Dr. Pratt writes as follows:

"Of these three conditions in which the phosphate is found, the first two are their natural positions, and in either of these positions the phosphates become a valuable adjunct to the fertilizing power of the marl, and it is probably due, in great measure, to this element that the Ashley river, or more recent marls, have proved so beneficial when judiciously applied.

"Where this substance was originally deposited, perhaps as the excrements of birds, etc., in a bed or near the surface of the undisturbed marl below, especially if in a semi-consolidated form, sometimes met with, it may be mistaken, at sight, for pure white marl, whereas analyses show in samples of this kind not less than sixty-three to sixty-six per cent. of pure bone phosphate of lime, and not more than five to eight per cent. of carbonate of lime. This fine soft material is easily washed away when exposed to currents of water, and may be conveyed and redeposited in more quiet places. Sometimes this superficial bed is consolidated and hard, the particles having been cemented together perhaps by the deposit of phosphate of lime formed when the soluble phosphates of the tissues and excrements came in contact with lime in solution. When in this condition they are insoluble and hard enough to resist attrition, and when undermined by currents of water washing away the softer marl on which they rest these hard lumps fall to the bottom of the stream. Thus deposited, they constitute the third condition mentioned in which we find the phosphates, and in that in which they are best known and generally recognized, and in this form demanded our attention."

A third source of phosphoric acid is found in some of the natural guanos which are formed in a climate having sufficient rainfall to wash out the nitrogen and leave the phosphoric acid; of these the Sombrero and Nevassa may be taken as types, they differing from other guanos mainly in the absence of their nitrogen which has been removed by rain. The following show the average of a number of analyses of Sombrero and Nevassa guano:

Moisture, ...	3.07	Phosphoric acid, ...	32.89
Organic matter, ...	2.40	Carbonic acid, ...	8.73
Oxide iron, etc., ...	3.03	Sand, etc., ...	2.45
Magnesia, ...	0.60	Undetermined matter, . .	3.40
Lime, ...	46.43		

When the present supply of South Carolina rock is reduced or when it must be taken from a depth which will increase its cost, these guanos will again become an economical source of phosphoric acid.

There has recently been placed in the market a supply of phosphoric acid obtained from earths rich in phosphate of alumina (the other common forms being phosphates of lime) which far surpasses all other sources in the percentage of available acid which it contains; samples analyzed by our chemists have shown 40.50 of available acid and the manufacturers guarantee 40 per cent. The mode of manufacture is not made public, but the analyses show that of the 40 per cent. which is available nearly all is in the form known as "reverted;" thus far very little from this source has found its way (in its unmixed condition) into the hands of the consumer, the bulk of the manufacture being taken up by the manipulators of fertilizers who use it as a source of available acid and add "fillers" to give bulk and reduce the price to the consumer.

In reference to the comparative value of "soluble" and "reverted" phosphoric acid (usually classed together as "available"), Dr. Genth, the chemist of the Board, writes us as follows:

"The fact that the greater part of the phosphoric acid goes in solution, if treated for half an hour with citrate of ammonium at 150 degrees (Fah.), appears to give it the same value as the so-called "reverted" in fertilizers containing lime as a base, and I have no doubt that it is just as easily assimilated by the plants, nothing injurious being present. Whether "reverted" phosphoric acid is as good as "soluble," is a question which, by actual experiments on the farm, has abundantly been answered in the affirmative, and on many soils it is of higher value. Although I believe the available phosphoric acid of this brand to be of equal value as that of phosphates manufactured from South Carolina rock, I do not know this to be the case; for this reason I would strongly recommend that you would have such experiments made at the experiment station connected with the State College."

Another source of phosphoric acid already made available in Europe but not yet called upon here on account of the low price of the South Carolina rock, is to be found in the immense piles of basic slag which surround and obstruct our Bessemer steel furnaces.

In the manufacture of steel the immense "convertors" in which it is "boiled" are lined with a preparation containing lime; the phosphorus present in the ore unites with this lime and forms phosphate of lime; by the usual chemical process the phosphoric acid may be made available and take the place of similar material in the fertilizer market; as before stated its use thus far has not been attended with success, on account of the extremely low price at which available phosphoric acid from South Carelina rock and phosphate of alumina can be furnished.

It has been claimed that if the basic slag, as it comes from the steel works, is crushed into a fine powder, by machinery similar to that now used for grinding South Carolina rock, a valuable fertilizer is obtained, and that the use of acid to render the phosphoric acid available is unnecessary. It is further claimed that the phosphoric acid being in partial combination with an excess of lime, is even more readily available than that from any other source. Time will prove or disprove the correctness of these assertions, but enough is known to satisfy all that this source of phosphoric acid, almost inexhaustible as it is, must at some future time become valuable. Unfortunately the process of convertion into fertilizing material is in the hands of one corporation in this country, and upon them depends its price and use as a fertilizer.

Analyses of Commercial Fertilizers.

During the past fertilizer year (from August 1, 1887, to August 1, 1888) an official analyses of four hundred and eighty-six samples of commercial fertilizers have been made and the result published for the benefit of both consumer and manufacturer in the form of tabulated analyses lists, of which the Board has issued at least 32,500 copies, and manufacturers whose fertilizers have successfully passed the imposed test have also published large numbers as an advertising medium, and it is, therefore, perfectly safe to estimate the total issue of these lists at not less than 40,000 copies.

These samples have been selected under oath or affirmation by agents of the Board, in accordance with the following instructions:

"Section 4 of the act of June 28, 1879, provides that 'It shall be the duty of the Board of Agriculture to analyze such specimens of commercial fertilizers as may be furnished by its agents, said samples to be accompanied with proper proof, under oath or affirmation, that they were fairly drawn.'

"By a vote of the Board, its Secretary has been authorized to appoint 'Special Agents of the Board,' whose duty it shall be to collect and forward samples of fertilizers for analyses in accordance with the above provision; and to secure fairness and uniformity in the samples forwarded, your attention is requested to the following directions, with the request that all selections shall, as far as possible, be governed by them:

"*First.* That while the law is designed for the protection of the consumer, it was not intended to do injustice to the manufacturer, and hence in all cases of doubt as to the correctness of the sample, the manufacturer should be accorded the benefit, and the sample discarded.

"*Second* In making selections of samples, care should be exercised to obtain them from goods made for the season during which they are selected; with even good care there will always be a certain percentage of waste in fertilizers kept over season. In many cases, manufacturers change their formula after spring sales are effected, and for autumn sales put another quality (under the same name) on the market. This being the case, it is possible the unintentional injustice may be done to the manufacturer by forwarding samples taken from the stock of the preceding season. In all cases when samples of over year goods are sent, the fact should be so stated.

"*Third.* Care should be taken to send with the sample, or in a letter by same mail, the following particulars: The name and address of the manufacturer; the exact name of the fertilizer as copied from the package, bearing in mind the fact that a number of manufacturers have brands on the market which differ in name but to the extent of a single word, the omission of which might not only deceive the consumer, but also be a cause of injustice to the manufacturer; the place at which the sample was selected; and the retail price per ton *cash at the point at which the sample was taken*—this latter item is not necessarily for publication, but as a source of information to inquirers and to enable the Secretary to rectify possible errors in the names of the fertilizers.

"*Fourth.* In selecting samples care should be taken to obtain one which will, as fairly as possible, represent the bulk of the goods; for this purpose a portion should be taken from different parts of the same bag, or from different bags, and the final sample taken from a mixture of all of these, thus securing a fair *average* of the goods from which the sample was drawn.

"*Fifth.* Samples sent in papers or paper boxes will, in the course of passage through the mails, often lose a portion of their volatile elements; to avoid this the Board will furnish all agents with metal sample boxes with air-tight lids; these may be sent by mail or express, at the option of the agent; if sent by express, glass bottles, tightly corked, may be substituted for the metal boxes, but the latter are preferable.

"*Sixth.* All expense of postage or express will be assumed by the Board, and where it is specially authorized the Board will assume the actual and necessary travelling expenses of its agents when engaged in the duty of procuring samples for analyses. In all cases the latter item is only assumed by special and written agreement with each agent.

"*Seventh.* From the fact that the Board has in several cases been deceived by interested parties who have forwarded samples, it has been decided to receive no samples unless vouched for by one of the special agents of the Board. To accommodate consumers and manufacturers, these agents will, so far as possible, be appointed in each district, and attention is requested to the fact that it is the duty of every member of the Board to select and forward samples where there is no special agent appointed for this purpose.

"*Eighth.* Inasmuch as the fund available for the purpose is limited, the Board reserves the right to decline to make an analysis of a sample which is a duplicate of one recently tested, or to decline to make an analysis when the funds available are exhausted; and to assist in this distribution of the work it is requested that agents will (unless specially requested to do so) be careful not to duplicate samples of the same spring or fall goods.

"*Ninth.* In order that fertilizer agents may be protected from any loss from a violation of the law, our special agents are requested to inform them that a non-compliance with the provisions of the law on the part of the manufacturer subjects the agent selling or offering the goods to the full penalty upon each sale or offer to sell.

"*Tenth.* In filling the sample boxes, care should be taken to screw each lid tightly into its place, and to place inside and outside of the box some mark by which it can be distinguished in the list to be sent by mail; it must be remembered that the Secretary receives samples at all times, and that without some distinguishing mark the whole labor of the special agent will be lost through the inability of the Secretary to recognize the sample when received."

In all cases as soon as an analysis has been reported by the chemist, an official copy has been sent to the manufacturer with a printed notice to the effect that no official use would be made of it until an opportunity had been given for all proper claims of error either in the selection of the sample or in the analysis; in all cases where a reasonable claim of error in either is made, the matter is carefully investigated and if the claim is found to be well founded the analysis has been discarded and another sample drawn. With the care exercised in this respect it is believed that no interested party has been unfairly injured by the analyses.

When a sufficient number of analyses have been collected they have been published in the form of our tabulated lists, of which in various forms at least thirty-two thousand five hundred copies have been issued. In all cases they have been distributed free to all applicants and have kept the farmers of our State posted as to the condition of the fertilizer trade in a practical way. Good judges, interested in the manufacture of fertilizers have estimated that the publication of these lists has been the means of increasing the average value of our fertilizer fully three dollars per ton; as the annual consumption of this class of goods amounts to about one hundred and twenty-five thousand tons, it follows that the saving to the consumer has not been less than $375,000 per annum.

The total cost of the work has been $7,476.70, which has been paid from the special fund arising from the payment of license fees by the manufacturers, under the provisions of the act of June 28, 1879, which also authorizes the analyses by the Board; this amount includes the actual cost of the analyses, the expenses of agents in selecting samples, express charges on samples and postage.

Whenever a fertilizer has been found not to come up to the standard guaranteed by the manufacturer, and recorded in the office of the Board, notice is given of the fact and also of the liability of the manufacturer and agent for the penalty of the act of 1879; in all such cases the goods have either been withdrawn from market and remixed, or they have been temporarily withdrawn and rebranded to correspond with the analysis as given by the chemist of the Board; the saving to the consumer in this respect is considerable and should be credited to the action of the law when the balance is struck.

The appreciation of manufacturers is shown by the fact that it would be impossible for the Board to pay for the analyses of one-half of the samples which they ask to have drawn by our regular agents, and the Secretary has, in a number of cases, been compelled to positively refuse to order samples of certain manufacturers drawn. Some appear to regard it as a right conferred by the act of June 28, 1879, and that it is the duty of the Board to have samples drawn whenever asked by either manufacturer or consumer; a careful reading of the law will show that the Board can only accept "such samples of commercial fertilizers as may be furnished by its agents," and that the Secretary cannot accept samples from unknown individuals.

In very many instances the consumer prefers to purchase the ingredients of a commercial fertilizer and mix them himself; in other cases a member of a club will purchase the ingredients and mix the fertilizer for the other members; this has given rise to a desire upon the part of the consumer for some system of inspection which will ensure that he shall receive what he pays for in the ingredients used; in a number of cases these ingredients have been found to fall short of the manufacturer's guarantee and in such cases, unless he is protected by a written guarantee, the consumer loses. This at once raised the question of the liability of those who sold fertilizers supplies for mixing in this way, to the provisions of the act of June 28, 1879; a case was stated and the advice of the Attorney General asked; the opinion of the Attorney General is as follows:

"By yours of the 12th inst, with its accompanying enclosure, you submit the question whether the act of June 28. 1879 (P. L. 180), applies to a manufacturer of an ammoniated phosphate containing phosphoric acid and ammonia, who sells that substance to farmers for the purpose of enabling them to combine it with other material for use as a fertilizer.

"We are of the opinion that the act of Assembly in question does apply to the manufacturer who engages in transactions of that kind.

"By section 6 of the said act, the term 'commercial fertilizer,' as used therein, is defined to mean any and every substance with certain exceptions not necessary to be noticed, which is imported, manufactured, prepared or sold for fertilizing or manuring purposes. Section 1 refers in terms to fertilizers containing ammonia and phosphoric acid.

"The substances referred to and the use for which they are intended to be applied, as stated in the question put, are therefore clearly within the terms of the act of Assembly and we think quite as clearly within the general shape and purpose of it, to wit, the regulation and inspection of sales of commercial fertilizers, for the protection of the consumer."

This decision being in entire sympathy with the spirit and tenor of the law (the protection of the consumer) it follows that any consumer purchasing chemicals containing either potash, phosphoric acid or ammonia, in bags not properly stamped, or for which no licence have been taken out, has his proper remedy in the application of Section 3 of the act of June 28, 1879.

Sugar from Sorghum.

During the prevalence of the high prices of sugar and molasses, which resulted from the war of the rebellion, sorghum, as a source of molasses, was largely and successfully cultivated in our State. With the return of low prices which followed the cessation of war, its cultivation was gradually discontinued, the charge for manufacturing the molasses from the cane was not reduced and as a competitor of the sugar cane, sorghum was not a success; at that time but few attempts had been made to manufacture sugar from it, but that its juice contained considerable portions of sugar was admitted.

The high price attained by sugar during the war drew attention to all sources from which it could be obtained and among them the sugar beet; in California, Indiana, Delaware and Wisconsin, factories were erected and large areas planted with the most approved kinds. While it was clearly demonstrated that American beets possessed saccharine qualities as great as those produced in Europe, yet, notwithstanding State bounties in at least one case, the production was unprofitable and has been completely abandoned, California being the last to give it up. The difficulty was not so much in the actual production of sugar in the beet as it was to devise some process by which it could be extracted and crystallized; molasses of good quality could at all times be produced, but in competition with the sugar cane or the glucose syrups from corn, beet sugar proved unprofitable.

Following closely in the wake of the downfall of beet sugar, sorghum was introduced and cultivated as a sugar producer. In New Jersey and at Fort Scott, Kansas, large factories were built. The United States Government made extensive appropriations for experimental work, and it was clearly demonstrated that the sugar in the sorghum cane could be crystallized. New Jersey offered bounties for sugar thus produced and, except from causes not fairly chargeable to the industry, it would appear that the result was profitable.

Alive to the encouragement of any new industry the Board of Agriculture appointed a standing committee on Sorghum Sugar, and at its meeting at Warren adopted the following:

"*Resolved*, That Governor Beaver be requested to present the subject of the production of sorghum and beet sugar in Pennsylvania to the next Legislature, with such recommendations for its development and encouragement as the best interests of the Commonwealth demands."

Arrangements have been made to give the question a careful examination at the next annual meeting of the Board (January 23, 1889) and to obtain all the information relating to it possible.

In his address at Lebanon, Governor Beaver used the following language: "I have lately visited the State Experiment Station in New York. * * * I met its accomplished director, Dr. Peter Collier, late of the Department of Agriculture at Washington. I was startled at the statement that he made upon a subject in which every thoughtful man must take a deep interest, and that was with regard to the production of sugar. Said he: 'You and I will live to see the day when sugar will be manufactured at a profit and sold at a cent a pound.' I looked at the man in blank amazement; I thought of beet sugar, sugar cane and everything likely to produce such a result, and when he said sorghum, I began to think of all of the difficulties that we had had here in Pennsylvania to get sugar out of the sorghum cane, and yet I sat down with him and went over the reasons which he gave, and as I looked at the products which he showed me of the sorghum cane, and saw some one hundred and eighty varieties growing at the experiment station and looked up in his office and saw the ripe cane hanging there; * * * as I saw the crystallized sugar made from the cane; as I saw in another department molasses made from sorghum; as I finally saw a fine paper pulp used to make paper, * * and then as I heard him say that all of these could be realized from sorghum, even in our climate, I began to look more and more in amazement at the man and began to talk over the difficulties that we had encountered. * * * I do not know whether Dr. Collier's statement can be verified; I do not pretend to say that everything that he told me will be realized in our generation, but if the one-hundredth part of it is true, we ought to be investigating the subject more fully than we are in Pennsylvania, for the sugar supply of the nation is one of the great questions of this generation."

It may be accepted as a fact that excellent sugar may be made from sorghum cane; it has been proven that with the best appliances and upon a large scale it can be made with profit even at present prices; it is certain that the industry is as yet only in its infancy, and it is probable that future inventions will so cheapen its production so that the expectation of Dr. Collier, as expressed to His Excellency Governor Beaver, may be realized, but before that can be accomplished we have much to learn and much to do.

The problem now to be met is what can the State do to foster and benefit this industry? Shall this be done by direct experimental work at our experiment station, or shall it be accomplished, as in New Jersey, by a system of stated bounties paid upon the manufactured article?

Either plan would appear to be within the province of our Legislature, and both have their disadvantages. Neither will be able of itself to make the production of sorghum sugar a success unless the manufacture is accompanied with sufficient profit to attract capital to it; any stimulative action given by the State will not be of permanent benefit unless the operation is attended with profit. In New Jersey the Legislature decided (if its action can be taken as indicating its opinion) that the experimental work should be left to private enterprise and that the State could best foster the new industry by bounties upon the product; in New York it would appear that the Legislature has taken an opposite view and have decided that the assistance of the State can most economically be given in the form of experimental work. We may state that there are three distinct propopositions to be considered:

1. Is it advisable that the State shall in any way assist to develop the industry or shall it be left to its own merits for further development?
2. Can the State best assist in its development by offering bounties at a fixed rate per pound on the manufactured product? or,
3. By making an appropriation for experimental work by which its practicability in this State shall be proven?

Dehorning Cattle.

For several years past the cattle owners of Nebraska, Wyoming and Kansas, have been in the habit of removing the horns of all cattle by sawing them off close to the skull; while the practice is extending and has been tried upon a large scale by many stock breeders and feeders, yet there is still a dispute as to its utility and advisability. Those who appear to have had the greatest amount of practical experience in dehorning appear to fully endorse it and to be more strongly convinced of its utility by each trial; several cases have been stated in which the animals have been materially injured by the operation, and in some cases death has followed; this is explained by those who favor the practice on the theory that radical errors were committed during the operation; in some cases it was performed at the wrong time of year; in others the amimals were exposed to cold rains; in some it was done in an unskillful manner; in most cases the injury was due not directly to the dehorning, but to subsequent exposure to cold and wet.

The extent to which the practice has been carried, may be gathered from the following extracts from correspondence:

At a farmer's institute at El Paso, John Evans stated that since October 1, 1887, he had dehorned 3,552 animals without bad effects in a single instance; Mr. Gifford stated that he had dehorned 1,000 with similar results.

G. S. Fisher, states in the *New England Homestead*, that in October, 1886, he personally saw 120 head dehorned in Nebraska, and that not one of them moaned even under the operation, and as fast as turned out, went to feeding.

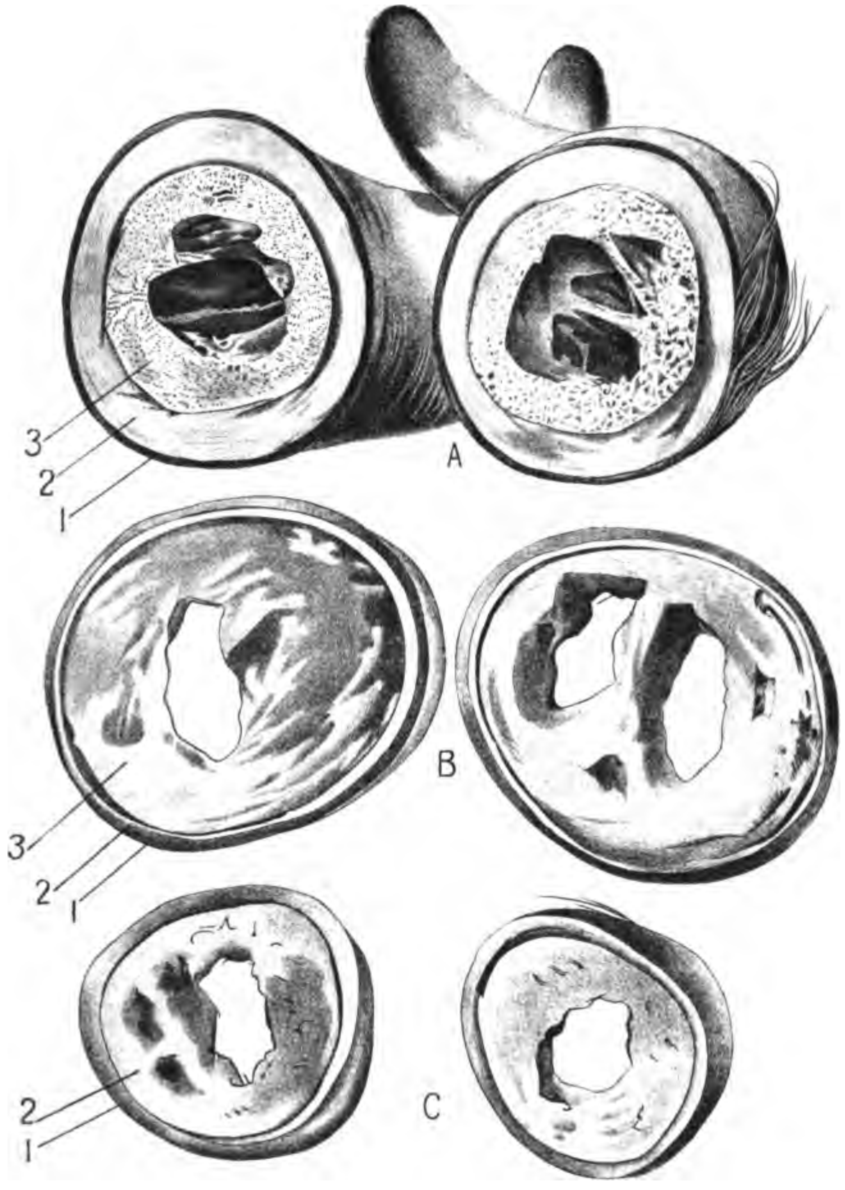
C. F. Riston writes, "I have dehorned between 200 and 300 myself, without any loss or a single failure.

M. D. Tallett, writes that in Kansas, near his farm, 700 head have been dehorned without any bad results, and that in December, 1887, he assisted in dehorning 10 head of all ages, from four months and upward; the cows did not shrink in their milk for more than one milking and he has yet to hear of a single dissatisfied person.

On the other side of the question we have the following evidence:

Dr. W. Horn, of Janesville, Wisconsin, writes that he knows of a case where 60 cows were dehorned and that in seven weeks their milk fell from 13 to 9 pounds; of another lot of 27 which were dehorned, five were very ill and two died; the others were materially injured.

A noted veterinary surgeon of Knoxville, Tennessee, writes as follows: "As I am called upon to give my opinion as to dehorning cattle,



Sections of horns removed by dehorning.

I will say that the operation of amputating the horns is very painful and not infrequently followed by bad results. It is surely a cruel practice, excepting for disease, fracture, faulty direction, deformity and to diminish damages from vicious cattle."

C. T. Fargo, of Lake Mills, Wisconsin, states that of 27 head which he dehorned, 10 have done well; with the others running sores were formed; there was a falling off in the percentage of cream.

There appears to be a difference of opinion as to the proper time of year for performing the operation, and those who have practiced it upon a large scale state that it should not be done during winter nor during warm weather in summer, and that all injuries reported have resulted from a disregard of this rule.

The claim that dehorning will make cattle less quarrelsome is not admitted by all, and those who have had any experience with a "muley" who by chance became master of the yard, will agree with A. L. Crosby, who writes as follows:

"One great objection made against horns is that cows often gore each other and thus cause abortion; what will be the effect of a hornless head propelled like a battering ram against a cow heavy with calf? How many ewes lose their lambs by crowding through gateways? One man states that "after he took their horns off, his cows clustered around the water trough and drank together peaceably, as many of them as could get their heads in at once. Several years hence when these same cows have got sound skulls once more, does any sane man believe that they will "cluster" around the water trough?

In Texas the same end is reached by removing the horns of all calves; while the horn is in the "button" form and before it is securely attached to the skull, it is removed by a sharp knife and aside from the loss of blood the animal does not appear to suffer any inconvenience from the operation.

In the plate (taken from the Report of the Tennessee Experiment Station)—A represents the horn of an animal 22 months old; 1, is a thin layer on hard horn; 2, is a thick flesh-like material laying between the bone of the horn and the outer covering; 3, is the true bone of the horn, by which it is attached to the skull. B represents a cross section of the horn of an animal four years old, and C that from the horn of a cow ten years old.

At the Tennessee Experiment Station the horns were removed by a sharp saw very similar to a common meat saw, with nine teeth to the inch, and the operation required from fifteen to twenty minutes for each animal, including some small calves. This has been sharply criticised by Mr. Haff, who has dehorned a large number of animals, as occupying an unnecessary length of time and that if properly done the operation should not require more than three to five minutes for each animal

In the Tennessee experiment a careful record was taken of the breathing, pulsation and temperature of the animals at different periods during and after the operation; these records clearly show great excitement, but do not necessarily prove pain; the report states that several of the animals bellowed loudly, but that it was "evidently more from fright than pain."

In Illinois the claim of cruelty to the animal was not substantiated in court; Mr. Haff was charged with cruelty in dehorning his cattle, but the prosecution failed to convict.

Forestry Notes.

At the last annual meeting of the Board the subject of forestry was made the leading topic for examination and discussion. Able scientists were present with essays bearing upon all branches of the question. Others who were well informed upon this and kindred topics were present and assisted in the practical discussions which followed each essay, and we offer the result of the meeting as a complete compendium of information upon the topics referred to. A portion of this information is given in another part of this report. A portion was given in the quarterly report, but a large proportion has been excluded for want of space.

It is the object of the writer to endeavor to collect, arrange and present to the general reader the summary of points brought out in the essays, addresses and discussions of the annual meeting. For this purpose, and with this end in view, it has been subdivided into paragraphs or topics, each covering some important point more fully developed either in the essays or discussions. The views here expressed are not in all cases endorsed by the writer, but an attempt has been made to fairly present all, without undue or unfair prominence to any, and without expressing the personal views of the writer.

From these notes, and from a perusal of the essays themselves, the reader cannot fail to perceive that the friends of forestry are by no means a unit either as to the results of reforestration, the effects of forests or the modes by which desired changes shall be brought about. To this difference of opinion we would attribute much of the difficulty which annually meets any attempt to secure legislation in the interests of forestry. So long as a wide difference of opinion exists among those who ask for such legislation it can hardly be expected that members of the Legislature, who have in many cases given the subject but little investigation, will endorse any specific plan or mode of remedying the evil, and hence we see that each session of the Legislature passes without any practical results having been reached.

Eleven years of observation having convinced the writer that this difference of views had much to do with retarding the application of a remedy, and believing that a complete and thorough investigation by a commission of practical men would benefit the cause, he was instrumental in offering to the last Legislature a proposition for the appointment of such a commission. Such a commission has been named by his Excellency Governor Beaver, and has given diligent attention to the questions assigned them. At the close of their examinations they will no doubt submit an intelligent and complete report which will, when placed upon record, furnish us with a guide for future action, and which will decide some of the minor points of controversy, and enable the Legislature to place upon our statute books such legislation as will best meet the case and remedy the evils which all admit prevail.

Among the many points presented at the annual meeting we place the following upon record:

1. The claim that forests in any way influence the *volume* of our annual rainfall is not supported by any tangible evidence or record. In fact it would seem as if it were easier to present evidence proving the reverse, or that rainfall is entirely independent of forests.

2. During the existence of the Board several attempts have been

made to obtain data to show any appreciable change in the amount of our annual rainfall, but thus far without any results.

3. Records of rainfall appear to show conclusively that there have been periodic variations in the annual amount, but these records fail to show any regularity in this variation and prove that a falling of at any given time is balanced by an increased amount at some other period.

4. There is sufficient data to lead to the belief that in different portions of the State the amount of the annual rainfall varies to the extent of several inches, and that this variation is of sufficient permanence and regularity to enable us to assign a regular average rainfall to each section.

5. The location of these different sections of rainfall is not such as will enable us to assert that they are in any way connected with bodies of timber land, or that they are to be located by any such existing causes.

6. That laws (either real or supposed) which has been received in the older countries of Europe, will not hold good here, and that thus far we can only lay down general rules which in the end will be modified by causes not yet properly understood.

7. That the present value of ordinary farm land in eastern Pennsylvania, and the unwillingness of our people to long wait for a return from an investment, will effectually prevent reforestration, which involves the use of land having a market value above ten dollars per acre.

8. That any attempt at reforestration, whether by State or by individuals, must be directed to lands having little or no value for agricultural purposes, and that all forestry legislation must be directed to this class of lands, or it must fail in its result for good.

9. That there are along the sides of the Alleghenies and Blue Ridge thousands of acres which can never be of much value except for the growth of timber, and which, if replanted would in time furnish our State with all the timber we will need.

10. That the demand for timber is decreasing, and on account of the increasing substitution of iron and steel the ratio of decrease must become greater each year, and that notwithstanding the increase in the number and size of our buildings, much less lumber is used (proportionately) than in former years.

11. That the greatest drain (after forest fires) upon our forests comes from the demands of our railroads for ties, but it is evident that before another decade shall have passed a substitute for wood, for this purpose will be found, and one of the greatest drafts upon our forestry resources removed.

12. That the theory that we are rapidly exhausting our forest resources and must sooner or later be called upon to meet a timber famine, is by no means a new one, it having been urged by Dr. Franklin and others of his time, with precisely the same argument as are now made use of.

13. That considered from an economic point of view there seems to be no danger of forest exhaustion, for the inventive genius of our people is such that before a want is scarcely felt a substitute is produced; in fact we may regard timber exhaustion as we now do the fears of an exhaustion of a supply of light by the destruction of the whale fisheries.

14. That admitting the climatic effects of forests, they must neces-

sarily be local in their character, and reforestration in one portion of the State will scarcely affect the climate of distant counties.

15. That the statement that our streams are much smaller than twenty years ago, must be taken with allowance and placed in the same category as somewhat similar statements, that our winters are not as cold and our summers warmer than formerly; neither of which statements are proven by records of temperature.

16. That so far as any examination has proven there has been no appreciable change in the amount of water which annually passes down our rivers and minor streams, and that statements as to its decrease are the result of but partial examinations, which have not been carried on for a sufficient length of time to obtain reliable data.

17. That records as far back as they can be secured show that our rivers were then subject to high floods and to low water from long continued dry weather, but the country not then being settled up and the means of communication being limited, we did not so frequently hear of damage resulting from either cause.

18. That it may be fairly claimed that large areas of forest near and along the head waters of streams serve as reservoirs of surplus rainfall, and that by thus preventing alternate low and high water, they equalize the amount.

19. That by their shade in summer and their shelter in winter and their open and porous soil during the whole year, our forests absorb and hold back the rainfall and give it off gradually to the water courses, thus directly producing the effect before alluded to.

20. That the bare hillsides, where our forests once grew, instead of retaining the surplus water, at once permit it to rush off into the nearest rivulet, and into the main artery of drainage producing the floods which, to a certain extent, might be mitigated if not avoided.

21. That for all purposes of climatic effect and influence on rainfall, etc., the foliage of recently grown clearings is as efficient as that of full-grown trees, because such clearings afford a larger leaf surface and a denser shade than does the full-grown timber.

22. That the cultivation of the formerly protected soil has an effect similar to that of reforestration, and that in many of our western states cultivation has brought about an increase in rainfall, and this too without any perceptible increase in the forest area.

23. That the "Great American Desert" of our school geographies, is gradually being circumscribed and reduced, and that as settlements are pushed out into its borders rainfall increases and cultivation becomes practicable and profitable.

24. That the effect of sheltering the soil with vegetation is to prevent evaporation. This has been proven by the increase in rainfall of the Great Salt Lake Valley and by the steady and constant rise in the level of Salt Lake.

25. That in the Utah basin the former relations between rainfall and evaporation have been disturbed by cultivation until at present the rainfall exceeds the loss by evaporation, and that this change will probably go on until by the great increase of surface exposure evaporation and rainfall are again equalized.

26. That so far all attempts to encourage reforestration by offering bounties have failed to produce the desired effect, and that anything of this kind to be permanent must appeal directly to the pockets of the land owner.

27. That exemption from taxation (even if not prohibited by the

Constitution) will fail to produce any good result because the indirect bounty offered is so small that it is not an object worthy of attention.

28. That, even if correct, the comparative climatic and sanitary effects of timbered and bare land, will have but little effect upon the present destruction of timber which will probably go on until it is gradually demonstrated that timber culture (for the timber itself) will prove profitable.

29. That so long as the present owner of available timber land can obtain a greater income from the timber in the market and from the land free from timber, he will not be turned aside by any question as to the effect upon the interests of the public, but will continue to market his timber in such shape as will give him the largest returns.

30. That but little that will prove effective can be expected from individual efforts at reforestration and that such work to be effective must be accomplished by an aggregation of capital controlled by plan of coöperation which will keep the expenses at a minimum, and enable the owners to market to the best advantage.

31. That forests, by the column of moist and cool air which hangs over them, often exercise an influence upon local rains and thus cause the deposit of rain at the expense of some less favored locality, but that this takes place without any increase in the general average annual rainfall.

32. That it is claimed that well forested areas are cooler than those not thus protected. That this is true of the surface actually covered is no doubt correct, but that it extends far beyond this area is not proven.

33. That the claim that forests in some way produce ozone or the health-giving element of the atmosphere, if correct, would indicate that since the destruction of forests epidemics should prevail with greater frequency and virulence, which is not correct, the proportionate deaths from this cause being less than in former years.

34. That Arbor Day planting is a practical step in the proper direction and by its actual effects and the lessons which it inculcates, will accomplish much in beautifying our State, even though it may not appreciable influence our climate or rainfall, and that thus far Arbor Day planting is the only practical result of State action, all other attempts having proven ineffective and useless.

35. That any practical mode of suppressing forest fires would do more towards reforestration than any other single integer, and that if we could effectually prevent them we might regard the forestry problem as settled. We should then soon have our forests replaced by natural growth which in the future, on the low-priced lands upon which it would exist, would prove valuable.

Will Drainage Pay?

A correct answer to this question is usually dependent upon data which is not furnished when it is asked, but which is absolutely essential to an intelligent and practical answer. It is yet an open question whether it will be found to be profitable to drain large areas for their agricultural value alone. In too many cases the cost of drainage, added to the original cost of the land, would create a sum so large that the product would fail to pay the interest, but there are certainly upon very many of the farms of our State small areas which will pay a very good interest upon the cost of drainage. In many cases areas containing but the fraction of an acre have been plowed around for years when they could (if dry) have been plowed and farmed with the remainder of the field with little or no increase in cost. In such cases we can fairly add to the benefit of drainage the additional benefit of the removal of an eyesore and an addition to the crops without a corresponding addition to their cost. The drainage of such plots will usually yield a handsome profit upon the cost and will prove an excellent investment for surplus funds.

To illustrate the point we will refer to a plot of this character with which we are familiar and no doubt our readers will be able to locate many similar ones.

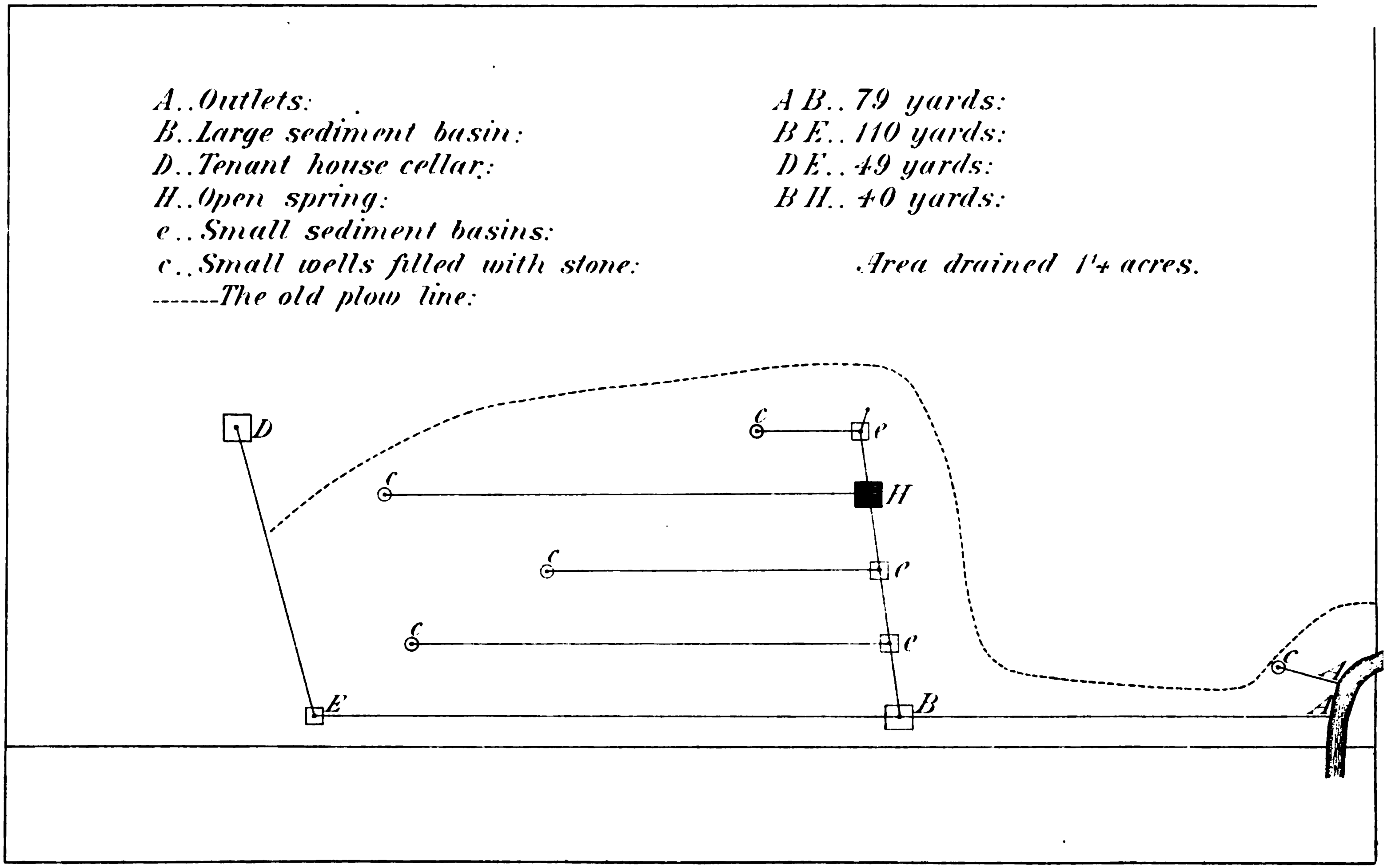
It contains about one and one-fourth acres and was probably never plowed; except in dry weather in midsummer it was so wet that stock could not go upon it. The little grass which grew there was so coarse as to be practically worthless and when the remainder of the field was under crops, the owner usually gave the grass to any one who would cut and haul it away. The cellar of a tenant house on one corner of the lot was flooded after every heavy rain, and for the purposes of its construction was an entire failure. A public road along the longer side of the plot was very difficult to keep in repair and more or less injured by quicksands. The plot has been drained and the following condition of affairs now exists. It produces as good or better crops than the remainder of the field of which it forms a part. The cellar is dry and does not overflow. The road is a comparatively good one and can be kept in repair for fifty per cent. of the former cost; and a blemish has been removed from that side of the farm. Instead of plowing in an irregular line around the patch, the plow now runs through it and by so doing the team does not have to travel any further than when he went around it. In every respect the condition of the plot and its surroundings have been changed for the better.

Many are fully prepared to admit the truth of all this, but consider that the benefits acquired are more than balanced by their cost. Having at hand an itemized cost of the work, we are able to give the following figures, which will show the amount which has been added to the permanent capital in the land and the reader can readily count up the interest which should be charged to the total investment. The items of cost (with a few unimportant exceptions) are as follows:

68 rods of ditch, 30 cts. per rod for digging and filling, ...	$20 40
1,075 two-inch tile at 14.00 per 1,000, ...	15 05
475 three-inch tile at $2.00 per 1,000, ...	9 50
Hemlock fence board (six inches wide) under tile, ...	9 50
Total cost of outlay, ...	$54 45

In this account no charge is made for hauling the tile four miles as the work was done at a time when the teams were not employed and no wages was paid out. No charge is made for superintendence; nor for an occasional hour's work done by the owner in laying tile. The account includes only actual cash outlays.

The ditches were opened and filled by contract; the workman boarding himself and charging thirty cents per rod. In addition to digging the trenches, he opened small shallow wells at the upper end of each drain; the contract for digging provided that the trenches should be of sufficient width to permit a six-inch-fence board to lay evenly on the bottom. The tiles were distributed from the wagon and hence no charge for this item is made. Old brick were used for the traps at the junction of the drains and they were laid by the owner, who made no


A..Outlets:
B..Large sediment basin:
D..Tenant house cellar:
H..Open spring:
e..Small sediment basins:
c..Small wells filled with stone:
-------The old plow line:
AB..79 yards:
BE..110 yards:
DE..49 yards:
BH..40 yards:
Area drained 1¼ acres.
D
E
H
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charge in the account. If the reader considers it essential that such items should be charged so as to cover his case, the proper allowance is easily made.

The amount of water in the drain was such that it was necessary to lay two rows of three-inch tile in the last eighty yards of trench, and even these were recently replaced (when filled up by roots) by larger tile.

Allowing for sundry items not stated in the account, we may perhaps fairly increase the cost to $60 for the job, and base our subsequent calculations upon this amount. Under the present rate of prices of labor and material, every item in the account might be decreased and the writer could at the present time repeat the experiment at a cost of less than $45.

The first two years that the plot was farmed, it was planted with corn and gave a yield of not less than forty bushels of shelled corn per acre, each year. This with its fodder was then worth $25 and would now be worth about $20 per acre or $25 for the whole area. During the following five years it produced an equivalent crop in oats, wheat, hay and pasture, so that for the seven years immediately following the laying of the tile, we may fairly credit the plot with produce equal to $20 per year. Deducting one-third of this for the cost of production we have left as a credit to the profit side of the account the sum of $16.50. During the seven years alluded to, it was therefore entitled to credits amounting in the aggregate to $115.50, or, in other words, the investment was repaid every three and one-half years, and it is good for many years to come. Aside from the agricultural value produced by the drains, the cellar of the house was benefited by an annual amount which would more than warrant the tenant in paying six per cent. upon the total cost of the work. The adjoining public road can now be kept in much better repair at half its former cost.

In its practical points the work was carefully done and all proper precautions were taken to guard against accidental stoppage of the drains. At the upper end of each drain small wells were dug (two feet in diameter and two feet deeper than the trench) and filled with small stone up to the level of the tile, practice having taught the owner that such a course was advisable. At the junction of the main and minor drains brick boxes were built into which each minor drain discharged and from which each larger drain too water. This secured the deposit of any sediment which might possibly find its way into the tile and also broke the current and prevented its obstructing the flow of the water. At the junction of one of the main and minor drains an opening was left from which pure spring water could be obtained for the occupants of the adjacent house. The outlet was protected by a dry stone wall and was formed of two joints of terra cotta pipe.

At no time within the observation of the writer, has the discharge failed to be sufficient in amount to fill an inch pipe and after heavy rains it would readily fill the three-inch pipe through which it discharges. It has only become choked twice during the eleven years and in both cases, this was due to the access of roots to the tile. To all appearances the job is to day as good as when it was finished and we see no cause which will be likely to prevent its continued action during the lifetime of the owner.

REPORTS OF COMMITTEES.

REPORT OF COMMITTEE ON ROADS AND ROAD LAWS.

By DAVID WILSON, *Chairman, Port Royal, Pa.*

(At Lewisburg Meeting, December, 1887.)

1. A county road should be thirty-three feet wide. This is the lawful width, and presupposes that three feet on each side is to be left unbroken for the protection of the land owners' fences and the safety and convenience of foot passengers, and the remaining twenty-seven feet are amply sufficient for the safe passing of vehicles.

2. A good road should be from point to point a straight line, as nearly as the nature of the ground and the money at command may permit.

3. The road-bed should have the form of the arc of a circle, the center of that arc being always the highest point in a line stretched across the road.

4. Unlike a railroad, a country road ought not to be a dead level, for this would render it difficult to keep the road dry, it is better to have slight and frequent grades.

5. A road should have a good ditch on each side, and these ditches should be of sufficient depth and width to carry off readily all the waste water that may fall upon the road-bed.

6. Where there is a long hill the road ought to have sluices or depressions to carry off the waste water as soon as possible from the road, and these depressions should be made not at right angles to the line of the road, but oblique, and should be always wide enough not to jar a light wagon when moved by a trotting horse, and not too deep. It is of the utmost importance that the water falling upon a road should run off as soon as possible into the ditches, and by means of these be carried entirely from the road.

7. Bridges and culverts. These, wherever needed are indispensable for safety and convenience, and are no small items in the cost of making and maintaining good roads. In a region in which hard wood is both cheap and convenient wood may be used with advantage, but wherever good building stone is convenient, stone structures are cheaper, more enduring, safer and far more beautiful. They admit of easier approaches and are attended with less danger of accidents in crossing. At the present time when so many traction engines and lumber wagons are continually on the road the bridge and culvert are found to need constant and careful watching.

8. The material out of which the road bed is made is to be gathered chiefly from the soil adjacent, and whatever harder material is needed to be put upon the top of the road bed, such as gravel and stone, should be broken up into pieces as small as hen eggs. A depth of two feet of small broken stone and covered with a few inches of clay would make a lasting road for all but very heavy hauling.

9. Loose stones should never be allowed to remain on the road.

10. A post and rail (three-rail) fence, as a safeguard and barrier

against accidents should be constructed and kept in good repair along streams and ravines wherever the roadway is narrow or the banks precipitous. This precaution would not only prevent many serious accidents, but would prevent a great deal of litigation and expense to individuals and townships.

Now something like the above is the road which the public wants but which it does not now enjoy. How shall this boon be secured to the public? For more than ten years past the Legislature of Pennsylvania in both branches of that honorable body have been wrestling with this very difficult subject, and although there are many special laws on the statute book supposed to meet the requirements of a few counties, and a few townships in other counties, the old laws for the most part are still in force throughout the State. The passage of a general road law by the Legislature has always encountered opposition from two classes of people, or rather of counties, *i. e.* the thickly settled counties and the thinly settled counties. In the former case a three-mill tax on the dollar will raise a much larger fund on the valuation than will a ten-mill tax in the latter. Hence small and populous counties, even with a two mill tax on the dollar, can raise a much larger sum than can the large and sparsely settled counties by a ten-mill tax on the dollar. Therefore the same law will operate unequally in different portions of the State, and must be unacceptable to many counties. Another source of opposition to a general law is the option, which by the present law the taxpayer has, of either "working out" his road tax or paying it in cash. In the thinly settled counties where the farms are large, and much of the land in its primeval state, the taxpayer prefers "to work out his tax," and put up with bad roads. Now, we think that both of these objections must be met, and fairly met, before any new road law that will give general satisfaction can be put through the Legislature. In the first place, the small and populous counties, by reason of the higher value of the real estate therein, can raise a large fund for road tax even on a one-mill assessment, and besides that there are many non resident taxpayers in such townships who prefer to pay their taxes in cash. Hence these townships can easily raise a large tax in cash without any one feeling the weight of it much; and this gives to them the additional advantage of having the ability to purchase, at cash prices, improved machinery, by the use of which their roads may be made and kept in repair at the least possible cost. And this fact explains the cause why the numerous special laws in some of the counties are satisfactory to the people, and why the citizens of such counties are opposed to and afraid of any interference with their present laws. Their cash plan of paying their road tax they have found, by experience, to be the cheapest and the best. But how is it with the counties large in territory but sparse in population, comparatively poor, and yet having a large mileage of roads to make and keep? They revolt against a ten-mill tax, and many of them are scarcely willing even to work out such a tax, preferring to endure the wear and tear, and loss and worry of bad roads from year to year. Now this is a fact that must be borne in mind by whomsoever any general road law may be formulated for the action of the Legislature. To illustrate how people feel on this subject, permit me to state that in Milford township, Juniata county, in which I reside, we have about fifty miles of roads. Owing to the mountainous region, the township resembles in shape very nearly an old-fashioned frying-pan, the pan part being nearly two miles square and the handle nearly twenty miles in length and about two miles wide. But the population is chiefly in the pan part from which nearly all the tax must be collected, and yet one road at least must be kept up for at least eleven miles of the handle. Of course the road tax is heavy every year. This state of things exists in many counties. If the present road law was amended so as to require all or a part of the tax to be paid in cash so that the supervisors might be able to purchase good machinery, no doubt the roads could be made and kept better and cheaper. But no road law can operate efficiently unless it is administered by capable and efficient men. Farmers and land owners have themselves to blame largely for the bad roads under the present general law, simply because they do not elect capable supervisors. Instead of choosing men for this important office on strictly business principles, as they ought to be chosen, they are selected more from motives of political expediency, sympathy, favoritism or some other motive rather than their fitness for the office. The supervisor is often more afraid of his workmen than they are of him. Even under the present plan of "working out" the tax, a good, energetic business man as supervisor would give us better roads than we generally have, and at less expense.

Your committee have not thought worth while to formulate any general road law to be recommended to the consideration of the Legislature, as that honorable body is competent to do this work more satisfactorily to itself. But the general opinion of the committee, and, so far as we are able to gather, the general opinion of the intelligent public, is that these two principles should be incorporated into the body of any general road law that may be passed by the Legislature:

First. That the road tax should be paid largely or wholly in cash.

Second. That the local option feature should be clearly embodied in the law.

The first would enable any competent supervisor to avail himself of the best times, the best methods and the best machinery for making and repairing roads; and the second would enable every county, and every township in every county to choose for itself between "the working out plan" and "the cash plan."

REPORT OF COMMITTEE ON GRASSES AND FODDER CROPS.

By H. M. ENGLE, *Chairman, Marietta, Pa.*

Quite a number of kinds of grasses have been tried as fodder crops, but when sifting them down to a few of the most important, your committee find that clover and timothy continue to be the leading kinds. In the rotation of crops these are almost universally grown. For permanent pasture green grass (Kentucky blue-grass) has no superior as to quality, and on some soils fair quantity. Orchard grass will possibly yield more weight of hay per acre than any other grass, as it can be cut three to four times in a season on rich soil. It has also the advantage of growing better in the shade (under trees) than any other grass grown here. Its disadvantage is the tendency to grow coarse or bushy when not well hit in seeding. Alfalfa has of late years been much praised and extensively tried, but not giving general satisfaction in this section of country. although quite popular in milder climates. Hungarian grass is valuable as an intermediate crop for hay which is of good quality when cut and cured at the proper time. It will no doubt continue to be grown as a crop to fall back upon when the general hay crop proves a failure, since it can be sown and made into hay in sixty days. Alsike clover makes excellent pasture and hay, but not so much as red clover, and is hard to cure. There is no fodder crop grown that will yield as much as corn, and when properly managed of quality little if any inferior to other fodder crops, whether prepared as ensilage or otherwise. As to the value and merits of ensilage your committee is not prepared to report as intelligently as our duties in this case require, since there continues to be strong arguments pro and con, but confident the case will be settled, or nearly so, ere long.

The value of all grains and fodder crops (except for pasture) depend largely upon the proper time and methods of cutting and curing, and upon this point there have been and still are differences of opinion. Some claim that vegetable growths retain the greatest amout of nutrition when ripe, or nearly so, and some chemists have sustained this view. It is not the province of your committee to question scientific reports, but actnal results should also have some weight in deciding the question of the period, when fodder crops are of most value for stock feeding. It may be possible that they do contain the largest amount of nutrition at the period referred to, but the question is can an animal extract as much from a plant when ripe as a chemist can? Whether at the period when grasses produce the largest flow of milk, and when stock thrives most would not be the best time to cut and cure fodder crops, even if they did not contain the greatest amount of nutrition. That period seems to be just at the time of blooming, and when they contain the largest amount of saccharine matter.

REPORT OF COMMITTEE ON DAIRY PRODUCTS.

By Eastburn Reeder, *Member from Bucks, Chairman.*

Our last annual report for 1887, contained the history of the legal proceedings in testing the constitutionality of the oleomargarine law, by stating the decision of the Supreme Court of the State of Pennsylvania, which was in its favor. Since that time the case has been carried up to the Supreme Court of the United States, which has now also decided in its favor by affirming the decisions rendered by the lower courts. We have gained a triumph of which we should feel both proud and grateful. Proud because of the part taken in framing the law, in securing its passage, and in victoriously defending its constitutionality; grateful, because justice can now be enforced not only to the manufacturers, but to the consumers of dairy products.

Our reports from various sections of the state show a healthful condition of the dairy industry, and hopes for farther improvement in the future.

J. A. Herr, of Clinton county, under date of September 24, writes as follows: "There is very little change in the dairy interest in this county. There is a tendency to improvement in live stock in the better breeds. Cows have been selling a little higher than usual, and there has been considerable demand for Jersey cows. Prices for butter have kept up unusually well, and are now from twenty to twenty-five cents, for good butter. There are no creameries in this county so far as I know."

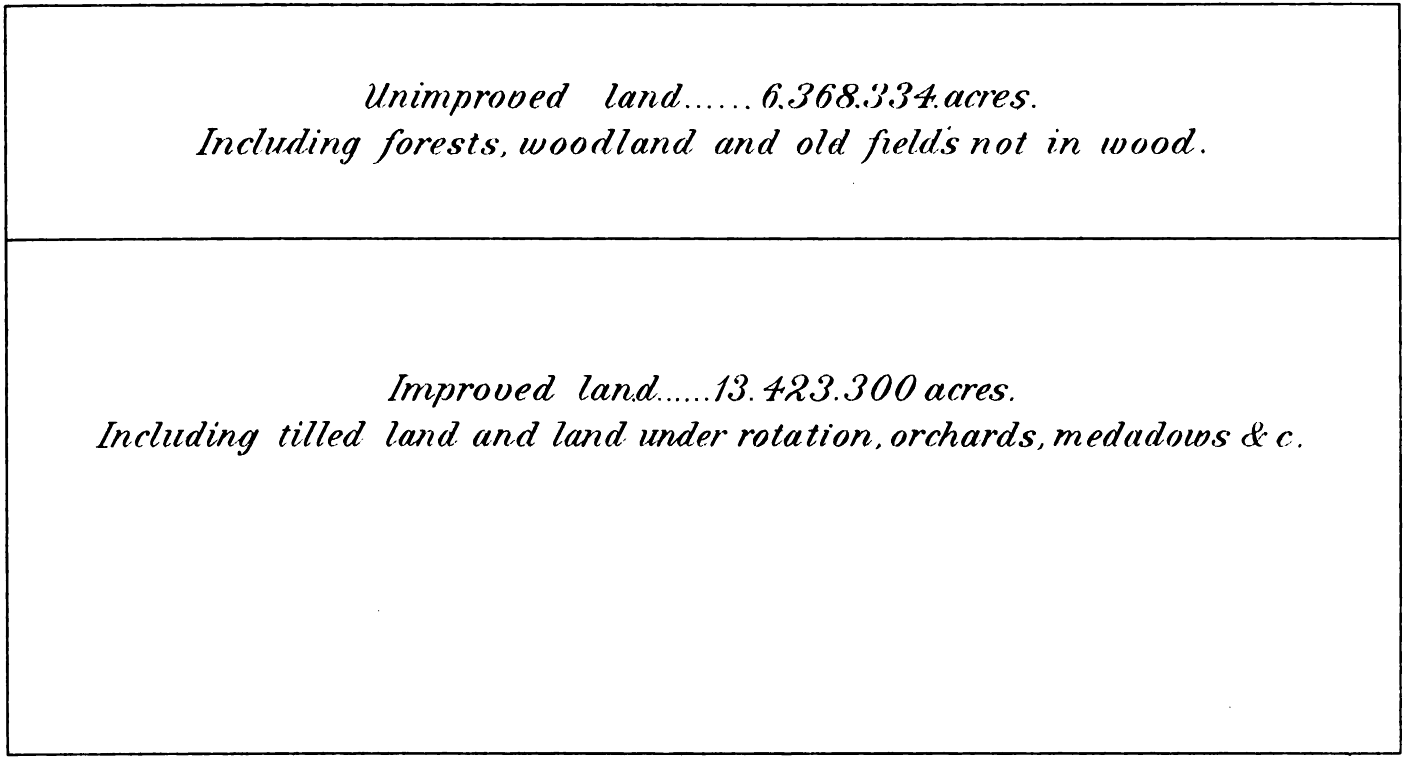
N. F. Underwood, of Wayne county, September 28, reports as follows: "Replying to your inquiries concerning dairy matters in this county, would say average price of fresh cows, thirty-five dollars, and not plenty. Average price of cows milked this season, and to come in next spring (March to May), twenty-four dollars. Highest price for butter this season shipped to New York, twenty-five cents. Lowest price, sixteen cents. Present price for butter packed and held during season, in good order, twenty cents. Extra fresh tubs in near-by market, twenty-two cents. The average yield of butter per cow in county will not exceed 150 pounds, some dairies make 200 pounds per cow. The dairy business as usually conducted here does not hold out much encouragement. Following the same system with the same cows we cannot expect better results. The only prospect for making the dairy business more profitable here seems to lie along the line of improvement in stock, better feeding, and a system of marketing which shall dispense with the commission man. I believe no county in the State offers better natural advantages for dariying than Wayne. Creameries, so far, have not proved an unqualified success. No cheese made at present in the county."

H. L. Scott, of Bradford county, October 4, writes as follows: "Would report that the dairy interest in this county the present season is considered to be in a very good condition. Dairy cows are worth from twenty-five to twenty-eight dollars each. Butter is worth twenty and twenty-one cents per pound, with quick sales. The present feeling is very firm, and the future outlook is hopeful."

J. McDowell, of Washington county, October 4, writes as follows: "I regret that I have not the full information in regard to the dairy industry of our county I would like to give you. I would name the following creameries now in operation, but I cannot give the amounts made of cheese and butter, nor the prices:

For cheese—address the Bulger cheese factory, at Bulgar, Pa.

For butter—address the Chartier's Creamery Company, Houstonville, Penn'a; the branch of the same at Hickory, Pa.; Nellwood Creamery, at Patterson's Mills, Pa.; Woodrow's Creamery at Woodrow, Pa.; Primrose Creamery, at Primrose, Pa.—This latter is just started; The Washington Creamery, at Washington, Penn'a. In the Chartier's Creamery and its branch plant the company of farmer's who have stock, held a meeting and fixed the price of milk for the six summer months, at eighty cents, and for the six winter months at $1.25 cents, per 100 pounds. The average price of creamery butter, twenty-five cents a pound. The average price of cows may be put at thirty-five dollars. As to the feeling among producers, they are not satisfied, as labor is not fully compensated. They think they should have eighty-five cents per 100 pounds for the summer months, and $1.50 cents for the winter months. At some of these plants the cream is separated by centrifugal work, and the milk made into cheese. In others they send, or rather sell cans at $1.50 each, that have cream gauges. They send out wagons to collect these cans and pay a low price—so low that the farmers complain, and many have ceased to



DIVISION OF LAND IN FARMS IN PENNSYLVANIA.

Total land in farms.... 19. 791. 341.

patronize. They also object to the compulsory sale of cans with gauges. This is the method with the Washington creamery, and unless it gives better satisfaction, it cannot hold out. We have several creameries in our county. The Bulger factory makes very fine cheese. Our sheep men are generally quitting the business of wool growing, and are turning their attention to the dairy interest. With some the dairy business is an experiment, while others have settled down to it. Many others, and I think by far the larger part of those living near the railroads, ship their milk to Pittsburgh.

All who do this, with few exceptions, are satisfied with the profits. Those more remote from market furnish a large amount of good and bad butter for the army of hucksters who pay from ten to eighteen cents a pound, and is sold in Pittsburgh generally. One reason why they get poor butter is the low price they pay. Grocery men too, send out their wagons weekly among the farmers and pay the same price for the poor that they do for the good, firm, solid butter, and retail the good butter at a high price, and the poor kind at a profit of five cents a pound. Many of these same grocery men long for the repeal of the oleomargarine law. In conclusion, I have to say that the producer is much imposed upon by the hucksters and retail grocery men, and by the factories to some extent, and I hope ere long all producers of butter will see the importance of making a first-class article, and receive an adequate price. There are many dishonest buyers who pay a low price, and others cheat in the weight. I now leave the subject with you, and wishing you success in your coming needed report."

Israel Garretson of Adams county, October 8, sends report as follows : "I wrote to three creameries in operation in this county asking for information but have received no reply. These creameries buy milk and cream and pay from seventy cents to one dollar per hundred for milk. They find a ready sale for their butter, and are increasing their facilities for manufacturing. Good dairy cows can be bought from thirty dollars to thirty-five dollars. There is quite a number of farmers throughout this county who are turning their attention to dairying, since the prices of grain have been so low. They find a good market for dairy products at the city of Baltimore. Average prico for butter twenty-eight cents per pound by the year. Then go through the country and buy it up at prices ranging from ten to eighteen cents, seldom surpassing the latter price. The present feeling among the progressive farmers is to make dairying the first object, as grain raising is a secondary business. Farmers who have turned their attention to dairying have improved their farms, and have saved some money, whilst those who have made grain-raising a specialty, are making their farms more unproductive, and have no gain, but a loss.

Charles Michener, proprietor of the Guernsey creamery of Adams county, furnishes the following additional under date of October 15, ——: "I have manufactured 64.711 pounds of butter, the average price received for it was twenty-five cents per pound. The average price paid for cream per gauge or inch was seventeen cents; for milk per one hundred pounds, eighty-five cents. The dairy business is in a prosperous condition. I can see an advance in that direction since I came to Adams county.

M. W. Oliver, of Crawford county, under date of October 15, sends word as follows: "The past season has proven quite satisfactory to the dairymen of this county. Seasonable rains have given an abundance of pasture so that the flow of milk has been rather above the average. Our system of dairying is changing somewhat. Until within the last two years, cheese only was made at our factories. Now we have three creameries within the county and others just over the line in adjoining counties, each conducted under the cream gathering system; their wagons traveling every part of the county.

This system of dairying is becoming quite popular, many believing it more profitable than cheese-making. Prices of dairy products have been,—prime butter from twelve and one-half cents in July to twenty cents at present time. Cheese from seven and one-half to eight and one-half cents. There is no lack of faith in dairying proving as profitable in the future as in the past."

From the foregoing reports it will be seen that the fears of those that the suppression of the oleomargarine business would be the cause of high prices for dairy products, have not been realized. The decline of sheep husbandry and the low prices of grain has caused many farmers to turn their attention to the dairy industry, and the increased supply of legitimate dairy products has supplied the increased demand at reasonable, but remunerative prices.

REPORT OF THE COMMITTEE ON FRUIT AND FRUIT CULTURE.

By J. A. HERR, *Chairman, Cedar Springs, Pa.*

Instead of attempting to make a report covering the whole field of fruit culture, your committee have thought best to endeavor to report the condition of fruit throughout the greater part of the State, and add some information on some points in fruit culture which the times seem to demand. With a view to obtain this information, a series of questions was sent to each member of the committee in different sections of the State. From their reports, we gather the following statements:

First. The crop of fruit this season has greatly varied in different sections of the State. In the eastern section a good crop of all kinds of fruit is reported, except pears, which were a failure. Grapes were specially fine. In the south-eastern, apples were but a partial crop. The northern tier of counties report from one-half to three-fourths of a crop. The central, not half a crop. Many of the apples were injured by frosts. In a few favored spots large crops are had. Strawberries were almost an entire failure in the central section, while in the east and south-east they were fine. Pears were generally scarce. In the south-west a good crop is reported. Cherries generally scarce. The ravages of the rose bug on grape vines seems to be increasing each year.

Second. The new tested varieties of fruits that are worthy of commendation are few. The following are named in different sections of the State:

For most sections the following new varieties are recommended:

Strawberries—Jessie and Bubach. *Grapes*—Moore's Early, Niagara, Worden, Pocklington and Brighton. *Currant*—Fay's Prolific. *Cherries*—Ida.

The Kiefer pear is recommended by some growers for the eastern and south-eastern part of the State. For the central and northern part they are, or ought to be, discarded.

The following new apples are favorably mentioned:

From Warren county the following are named: Duchess of Oldenberg, Indian Rareripe and President; also a sweet apple called Manaen.

From Lackawanna county—Sailor's Sweet, Mann and Clark apples are recommended.

From Wayne county—a new apple, not named; season August and September; smallish, resembling the Strawberry apple; a hardy and abundant bearer, raised by J. C. Menhennett, of Lake Como.

Third. The cultivation of small fruits is reported on the increase everywhere except in the central part of the State, where strawberries frequently fail, and the grape bug has greatly injured grape culture. Raspberries and blackberries are on the increase.

Fourth. The following varieties of grapes are recommended for general culture, viz: Concord, Niagara, Martha, Pocklington, Moore's Early, Worden, Delaware, Brighton, Salem, Hartford and Champion.

Fifth. There seems to be no practical remedy for the ravages of the grape or rose bug. Catching and destroying them is very slow work, and ineffectual. Spraying with diluted coal oil is recommended. Possibly the only safe remedy is to enclose the grape clusters, after blossoming, in paper sacks.

Sixth. Pennsylvania is not a wine-making State. There is some made in the eastern part, but not very extensively. Mostly the dark colored grapes are used, after being well ripened. Clinton and Agawam grapes are recommended for wine making.

Seventh. Peach growing is successful in a few localities, where the situation is wisely chosen and due care given to the cultivation of the trees and keeping out the borer. It is largely a matter of protection and care as well as of locality, and might be made much more general as well as profitable if these points were observed.

Eighth. Blight on pear trees seems to be decreasing. In many localities no blight is reported. Pears most exempt are Seckel, Kiefer, Buerre d'Anjou, Lawrence, Bartlett and Vicar of Winkfield.

Ninth. The following points should be observed in the preservation of winter apples:

(1) Pick early, before too ripe.

(2) Handle carefully and keep in an open, cool, shaded and dry place until freezing weather sets in.

(3) Repick and remove to a cool cellar, kept a little above freezing point.

(4) Put into close packages to prevent drying out, unless the cellar be moist.

The first two directions are very important in the central and southern portions of the State, where the seasons are long, and apples are apt to get overripe before being picked.

Tenth. The following six varieties of winter apples are recommended for the different sections of the State:

For the northern section—Baldwin, Rhode Island Greening, Northern Spy, Yellow Bellflower and King of Tompkins County. For the balance of the State the following six varieties are named, viz: Baldwin, York Imperial, Smith's Cider, Fallawater, Ben Davis and Hubbardston's Nonsuch. The following are also named for most sections, viz: Esopus Spitzenberg, Golden Russet, Newtown Pippin, Wagner Grimes' Golden, York Stripe, Winesap and Rambo.

REPORT OF COMMITTEE ON CEREAL CROPS.

By ISRAEL GARRETSON, *Chairman, Biglerville, Pa.*

The greatest importance of this agricultural industry, its greatness and diversity, makes it somewhat impracticable to consider the entire subject in one brief report. We will, therefore, confine this report to the consideration of a few facts relative to the wheat, rye and barley product.

For the purpose of ascertaining a few facts pertaining to this subject I addressed to each member of the committee the following questions, viz:

First. What was the acreage of the wheat crop (harvest of 1888) in your locality compared with crops of past five years?

Second. What is the yield per acre compared with past five years?

Third. How will the present seeding (fall of 1888) compare in extent with last year?

Fourth. Is the growing of rye and barley on the increase—to what extent, and why?

Fifth. Which of the cereals is the most profitable in your section?

Sixth. What is the average price of wheat (October 1) in your section.

Seventh. What is the cost per bushel of raising wheat in your section?

Eighth. What varieties of wheat are most successfully and profitably grown in your section?

Ninth. What varieties of wheat are most in demand for milling qualities, and what extra prices do they bring?

Tenth. What are the greatest hindrances to profitable wheat-growing in this State? Suggest remedies.

Answers were received from about one-half of the members of the committee, a condensed report of which we give:

First. The acreage of wheat crop in the eastern and central part of the State, and the western counties reported, comes up to the average of the past five years, with the exception of Lackawanna county, which reports a decrease in acreage of ten per cent. In Bradford county it is considerably less. The yield per acre varies, ranging from seventy-five to one hundred and twenty per cent. in most of the counties reported. The yield per acre is about an average, compared with the past five years. In Adams county the yield per acre is ten per cent greater. The average yield will be somewhat greater. Venango county reports one hundred per cent; Adams county, one hundred per cent.; Clinton county, one hundred and twenty per cent.; Union county, one hundred and five per cent, showing on an average a slight increase. Where there is any loss it is caused principally by the ravages of the Hessian fly, weevil and winter killing.

Second. Although there are some hindrances to wheat-growing, the seeding of this fall in acreage is greater than usual, except in a few localities. This, we think, is due to the fact that farmers feel the importance of engaging more largely in the cultivation of wheat, encouraged by better prices and the increasing use of fertilizers, thus enabling them to increase their acreage.

Third. The low prices paid for wheat has caused somewhat of a decrease on the average of acreage for the past few years, but notwithstanding the low prices paid, the present seeding (fall of 1888) is larger than usual.

Fourth. In most localities barley is not grown, and where it is grown at all, only to a very limited extent. The cultivation of rye is on the increase. In the counties of Bradford, Susquehanna, Adams and Lackawanna the cultivation of rye is largely on the increase, caused principally by the low price of wheat, and the straw can be sold at fair prices.

Fifth. In most counties, from which reports have been received, corn is the most profitable crop. In Adams, York and Venango counties wheat is the most profitable. In Lancaster, Dauphin, Clinton, Union and Bucks counties corn is the most profitable crop, and in Lackawanna county rye is the most profitable. This varies with localities.

Sixth. The present price of wheat in the different counties of the State varies from ninety-two cents to one dollar and ten cents. This is owing to the facilities for and the competition in shipping.

Seventh. The cost of raising a bushel of wheat varies from eighty cents to one dollar per bushel on an average crop of fifteen to twenty bushels per acre.

Eighth. The varieties of wheat most successfully and profitably grown are reported as follows: Venango county reports Fultz; Lancaster, Red Longberry and Democrat; Bradford reports the Wicks wheat; Lancaster county reports Fultz and Martin Amber; Dauphin reports the red bearded varieties; Clinton reports Fultz, Fulcaster and Longberry Red; Union county, Fultz; Adams county, Fultz, Shoemaker, Lancaster Red, Fulcaster, White Amber and Mediterranean; Lackawanna county reports Fultz; York county reports Fultz and Longberry; Bucks county reports Mediterranean and Fultz.

Ninth. There is but very little difference in the prices of the different varieties of wheat on account of their milling qualities. The Mediterranean, Lancaster and Longberry wheats are in most demand. The extra prices paid for them in no case is reported to exceed eight cents per bushel. The varieties that produce the best yield per acre are generally grown. The Fultz and Longberry varieties are most successfully grown and command fair prices.

Tenth. The hindrances to profitable wheat-growing are reported as follows: "Winter killing," "low prices," "poor quality of soil," "careless cultivation," "cheap lands in the west," "Hessian fly and weevil." The remedies suggested are: Early seeding, more fertilizing and a more thorough cultivation.

Remarks.—Taking into consideration the entire wheat crop for the season of 1888 throughout the State of Pennsylvania, we find that the yield is considerably larger than for the past several years. Wheat is not grown with profit in some portions of the State, and it is only by close management that it is grown without actual loss. With the introduction of new varieties of wheat which will increase the yield, an intelligent system of fertilizing, and with a more thorough cultivation, wheat may be grown with profit. Frequently the expense of keeping up the fertility of the soil will not allow the farmer to keep up the acreage of his products and in such cases it would be advisable to reduce the acreage and apply more fertilizers, and at the same time pay proper attention to thorough cultivation. Let abuses be corrected. and the State of Pennsylvania can successfully compete with all other States in the production of our cereals.

Eleventh. A special question was sent to each member of the committee, to be answered, in regard to the English sparrows being destructive, and what remedies could be suggested, which is reported as follows: Lancaster county reports English sparrows as being quite plenty, but not so destructive as in some other sections, with no remedies suggested; Clinton county reports them not so plenty, suggesting the remedy to "shoot the thief;" Union county reports, "that there is some complaint of sparrows eating wheat in mows," with no remedy suggested; Venango county reports them not plenty yet, and suggests "that they should be destroyed as fast as possible;" Bucks county reports them as not being very destructive as yet, and suggests as a remedy, "kill the rascals off;" York county reports them as not being destructive, and suggests no remedy; Adams county reports them as being destructive to some extent, and suggests as a remedy, "the destruction of their nests, and drive the old ones off as fast as possible;" Lackawanna county reports no sparrows in that section, and suggests no remedy; Dauphin county reports that they have not been very destructive in that section and suggests no remedy; Susquehanna county reports that they have been destructive there, and suggests as a remedy, "kill them;" Bradford county reports that they have not been very destructive as yet; they have just began their depredations in that section and are not general throughout the county; no remedy suggested. The English sparrow, wherever found, has been destructive to a great extent, which is very generally admitted, and it is the universal opinion and desire that they should be destroyed.

REPORTS OF HONORARY OFFICERS OF THE BOARD.

REPORT OF THE BOTANIST.

By THOMAS MEEHAN, *Botanist of the Board, Germantown, Pa.*

Among the advances made by botanical science, from a practical standpoint during the past year, is a better knowledge of the nature of hybrids. This has in a great measure been due to the labors of Mr. E. Carman, the editor of the *Rural New Yorker*, who has had interesting hybrids between wheat and rye, the raspberry and the blackberry, and other things.

About the end of the last century, it had come to be a prevalent belief that hybrids were generally sterile, an impression favored by the well known fact that the mule is, with rare exceptions, sterile

During the last half century, knowledge has progressed in this direction to such an extent, that those who have gone along with this advance, came to believe that sterility was rather the exception than the rule. Unions of two individuals are often sterile, though the individuals are not of distinct species, or even of distinct races, but even of families not very distinctly related. This is every day experience. As sterility is therefore common to close unions, and to distant unions, it needs no argument to prove that sterility is not the result of the distant union. Whatever be the cause, the degree of relationship can have had no hand in the matter. For all this reasoning, fortified as it has been by abundant illustrations, the mule and sterility have become so closely connected with hybridity, that it has been ignored by improvers. What is the use, they argue, to worry over the introduction of improved races by hybridization, if hybrids are sterile. The product is but a monster that cannot reproduce itself. Mr. Carman has shown conclusively that hybrids are not sterile; and his hybrids are not merely between species, but between such distinct genera as *Triticum*, the wheat, and *Secale*, the rye. The work of others has proved the same, but was not as well known. Mr. Carman's position has led the information far and wide, and is probably among the most useful pieces of botanical work for the year.

It may be here remarked that hybridization is useful chiefly as a means of introducing new races of plants or fruits. After the race is started, improvement must be by selection, saving seed from the best as we regard the best to be, and again saving; and saving in the direction of our thought for improvement. There is, in nature, a natural law of variation, independent of hybridization. No two things are exactly alike. It was the evident intention that no two things should be exactly alike. Yet there is such a condition of things as heredity. That which has been once achieved descends in a great measure to posterity. So that though seedlings come nearly like their parents, they vary in some degree. When we wish to perpetuate a variety, we weed out the wandering forms, and save seed from plants having the properties most like their parents. When we want to improve we have from these seedlings variations in our prospective line. Now that it is so generally conceded hybrids are as fertile as other variations, much more encouragement will be given to experimenting on new races of plants useful in horticulture and agriculture.

A correspondent sends the botanist a newspaper slip, stating that in California the chestnut has been found to graft on the oak. Reference is made to the fact that the writer when editor of the *Gardeners' Monthly*, exposed the fallacy that an apple could be grafted on the persimmon, and suggesting that this paragraph affords a chance for a similar exposure. But the cases are not parallel. Experience has shown that plants distantly related will not unite by grafting, but plants closely related may. The apple and the persimmon are too distantly related to make the union probable. The chestnut and oak are not more distantly related than the apple, pear, quince, and hawthorn, any of which will intergraft together. The oak and the chestnut are so closely related that there are some species that worry a botanist to decide whether they should be called chestnut or oak. From this experience there is no reason why chestnut and oaks should not unite by grafting.

The old and unsettled question of the influence of the moon on vegetation, has again been brought to the attention of your botanist. Botanical science is not warranted in saying there is no such influence. Observers who believe there is, are so numerous, that it appears incredible, such a general impression should be utterly groundless. All know that clear bright nights are favorable to the existence of dew and white frosts; and these conditions of the atmosphere again influence vegetation. It is but fair to admit that there may be some influence, but science has, as yet, failed to demonstrate it.

The unusually cool and moist weather that has marked the late summer and autumn in most parts of Pennsylvania, has led to attention to a botanical fact of great value in practice, that is often overlooked, namely, that while the leaves and branches of plants grow but during a few months during the year, the roots are growing continuously. A number of persons have called the botanists' attention to young white fibres in great abundance that were certainly formed during September and October, when, instead of growing, the plants were going to rest. Every one who plants cuttings must have known this. If currants and gooseberry cuttings are put out in September, roots will be found before frost, though the buds will not start till spring. The practical value of this botanical fact relates to planting trees. Trees die after planting from no cause but the drying out of their juices. If severe cold or drying winds follow directly after fall planting, or a hot dry spell immediately after a spring planting, the moisture goes out faster than the mutilated roots can supply waste. But if time be given for good vigorous young roots to form—roots that can push themselves closely in contact with the earth and suck the moisture therefrom—a full supply will follow the waste. As an abstract proposition, given with reference to dates in the calendar, there is no such thing as a best season for planting trees. The best season will vary from year to year. This year, those who planted in September, with about two whole months for new roots to push, and probably three before any very cold weather would make a demand on the branches for moisture, will have found a mass of new roots formed to supply that demand; and have learned that the best time to plant trees is to plant when the circumstances indicate that some time will elapse before there is any serious draft made by the weather on the branches for moisture. Those who planted in the parts of Pennsylvania as above indicated, the past September and October, will probably not have five per cent. dead the coming spring.

THE SWALLOW FAMILY.*

With special reference to species found in Pennsylvania.

By B. H. WARREN, M. D., *West Chester, Pa., Ornithologist of the Board.*

This family of birds, known by naturalists as *Hirundinidæ*, belongs to the order *Passeres*. Eight species are found in the United States, and six of these, viz., the Purple Martin, the Cliff, Barn, Tree, Bank and Rough-winged Swallows, are common with us during migrations and in the summer. The two species not found here are the Violet-green Swallow (*Tachycineta thalassina*), which occurs in the western United States from the Rocky mountains westward, and the Cuban Martin (*Progne cryptoleuca*), which is found in southern Florida. In these birds the bill is short, flat, triangular, wide at its base and deeply

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*The Swift (*Chætura pelagica*), or Chimney Swallow as it is generally called, although resembling greatly in its form, flight, food and twittering notes the Swallows, is not now included by naturalists in the same order, as was formerly the case when the Swifts, Night hawks and Whip-poor-wills were classed with the Swallows. The Chimney Swift, with its rounded or even tail feathers terminating in spiny processes, may at a glance be distinguished from a Swallow.

cleft, so that the gape is situated beneath the eyes. The bill terminates in a rather acute tip. The strong and somewhat scythe-shaped wings are long and acute. The first of the nine primaries (long stiff quills growing on the pinion or hand bone) is the longest. The capacious mouth is especially adapted to catch the various winged insects on which they prey, Their short and small legs and feet are poorly adapted for walking. "Swallows scarcely use their feet for locomotion, relying mainly upon their prowess of pinion." Tail of twelve feathers, in some species slightly forked, in others deeply so, and in those which have conspicuously forked tails, the outermost feathers are much narrowed towards the tips. The plumage is soft, smooth, and glossed above in all species but the Bank and Rough-winged Swallows, which are dull gray or brown, with steel-blue or greenish metallic hues. Swallows are the only birds of the order (*Passeres*) that have the mouth cleft far back of the base of the bill, as in the Night hawk. Whip poor-will and Chimney-bird, all of which, however, belong to the order *Macrochires*. Swallows are found in all parts of the country, though most numerous in the tropical and temperate regions; some species (Barn and Tree Swallows) often extend their migrations far north, and rear their young in the arctic solitudes.

Swallows feed exclusively on insects. They consume myriads of flies which so pester our horses and cattle or sorely vex the tidy housewife. Although unable to sing, as most small birds do, they have a lively and not unmusical twitter. Swallows are remarkable for their sociability; they migrate in flocks, sometimes numbering thousands, and nest together, often in large colonies. Living as they do, almost constantly on the wing, they visit nearly every locality, usually, however, when feeding and migrating they frequent ponds, rivers, streams, lakes, etc, where various kinds of winged insects are so plentiful. They frequently are seen to stop for an instant to drink and bathe when skimming over the water's surface. In clear weather, these birds often ascend to high elevations in the air, but in dull weather, particularly before rains, they fly low and sail close to the earth. With the exception of two species, all our Swallows lay pure white and unspotted eggs. The eggs of these two species—the Cliff and Barn Swallows—are white, speckled or spotted with reddish-brown, and so alike are the eggs of these two birds that they cannot with absolute certainty be distinguished apart when placed together. The usual complement of eggs of each of our species is five, sometimes six, but very seldom do we find three or a less number deposited when incubation is begun. The Purple Martin builds a nest of hay, straw, leaves, feathers, etc., in boxes* provided for them about houses and buildings; occasionally, with us, this species breeds in holes in trees. Its eggs average a little under one inch in length and about three-fourths of an inch or a little less in width.

The Barn Swallow nests mostly in the interior of barns, where, on a rafter or beam near the top of the roof, it builds a large bowl-shaped nest (not covered over the top as is the Cliff Swallow's) of mud, grasses and feathers. The eggs measure about .77 of an inch in length and about .55 of an inch wide. The Cliff Swallow, with us, nests under eaves of barns and other outbuildings. It never, I think, in this State breeds about rocks or cliffs, as it does in uninhabited regions. The nest is built of small mud pellets, warmly lined with feathers, fine dried grasses, etc., and in this locality is hemispherical in shape, with a small hole in front or on the side. The nest of this bird is usually described in books as being retort-shaped or bottle-like in appearance, with the opening built out, often several inches from the body of the nest. I have examined many nests of these birds found in Pennsylvania, but have never yet seen one which could be called retort-shaped or bottle-like.

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*For the benefit of those of my readers who may desire to place bird boxes about their premises, but have been deterred from doing so because they do not wish to furnish cosy quarters for the prolific and pugnacious English Sparrow, I would state that my friend Dr. John R. Everhart, West Chester, Pa., some few years ago erected in his yard a large pole, with cross pieces, from which were suspended, by brass wire chains, each about eighteen inches long, a number of boxes, in which the Martins, Wrens and Blue-birds nest without any trouble from the English Sparrows. The swaying motion of the pendant boxes appears to frighten the Sparrows, as not one has ever been observed to alight on or enter them.

The eggs are very similar in size, to those of the Barn Swallow, from which they are said to differ in being less elongated. The Bank and Rough-winged Swallows excavate holes in sand banks, along streams, deep railroad cuts, wagon roads, etc., in which they build loosely made nests of dried grasses and feathers. The Rough-winged, with us, breeds usually in the interstices of stone abutments of bridges or in the holes of old stone barns or other similar structures. The eggs of this last named species are possibly a trifle larger than those of the Bank Swallow, which measure about .70 of an inch long, and about .50 of an inch in width. The Tree Swallow builds in holes of trees and stumps, or in bird-boxes. The nest is similar to those made by Bank and Rough-winged Swallows. Its eggs are about the same size as those of the Rough-winged species. Swallows reside here from early in April to about the first of September, when they move southward, generally in large flocks, and winter chiefly beyond the southern limits of the United States. In the central and southern portions of Florida, I have frequently seen the Tree Swallows in loose flocks, during the winter months. While the Swallows are in many particulars alike, they can, generally, readily be distinguished from each other, either on the wing or when at rest. The Purple Martin (*Progne subis*), the largest of the family, is glossy blue-black, and has a conspicuously forked tail; the adult female and immature males, although dull brown and grayish in color have the tail forked like the old male and are also more or less marked with blue-black feathers, singly or in patches; these dark feathers most numerous on the breast give the birds a spotted appearance. The females, and immature birds are usually seen in company with the adult males.

The Barn Swallow (*Chelidon erythrogaster*), with its glossy dark back, rusty colored under parts, and deeply forked tail, the latter with a conspicuous white band across the middle, very apparent when the bird flies over you, is most easily recognized. The Tree Swallow (*Tachycineta bicolor*), has the tail feathers nearly even; under parts pure white; above greenish steel-blue.

The Cliff Swallow (*Petrochelidon lunifrons*,) may be known by his slightly forked tail and rusty rump, so very apparent when on wing. The Bank Swallow (*Clivicola riparia*) and Rough-winged Swallow (*Stelgidopteryx serripennis*) are not only alike in habits but they also greatly resemble each other in size and colors. The Bank Swallow has a white throat and a dark band across the breast. The Rough-winged Swallow has a uniform mouse-colored throat and breast. Both species have rather short and slightly forked tails. These throat and breast markings will generally enable you to recognize the birds in life.

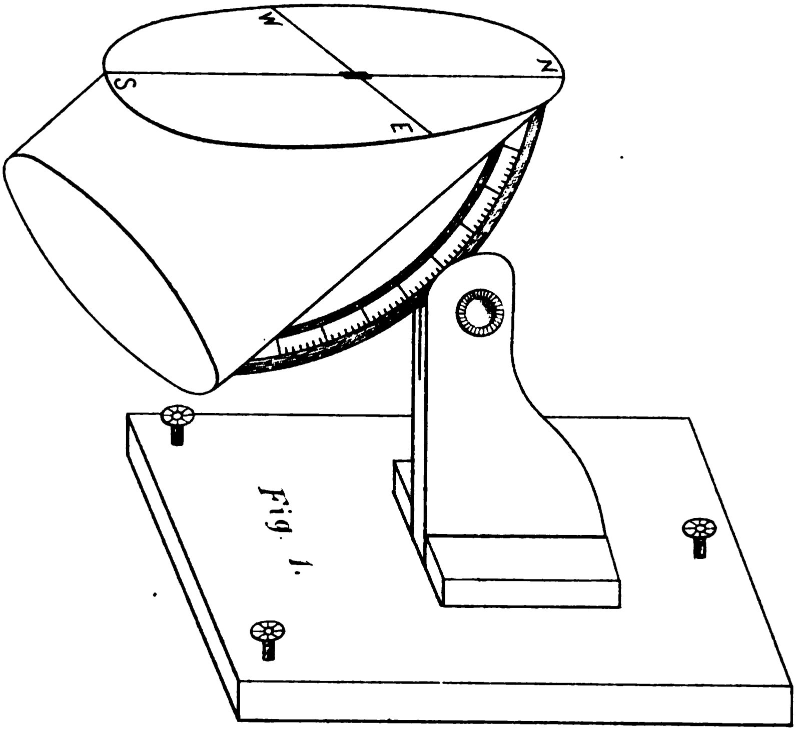

Fig. 1.

F, Flask

C, Camera

S, Slide (holding paper)

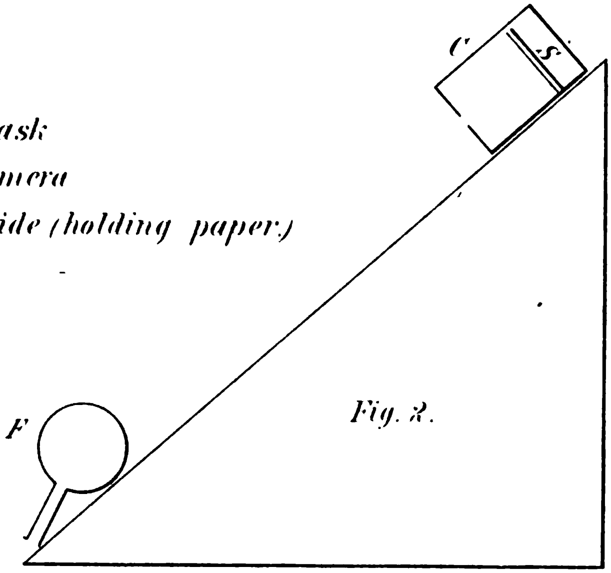

Fig. 2.

NOTES ON SUNSHINE OBSERVATIONS.

By Prof. I. THORNTON OSMOND, *Meteorologist of the Board, State College, Pa.*

The organic kingdom, vegetable and animal, the domain of life, is the highest and most complex realm of the natural world. All the relations, forces and processes of the material universe are involved in and affect its operations. They must, therefore, all enter into the discussion of the problems it presents.

The study of the conditions, favorable or untoward, of crop production, foresty, stock raising, public health and such subjects, must include all the factors or it will be incomplete and untrustworthy.

The soil and its culture, the fertilizers used, the rainfall, the daily temperature—solutions of the questions of scientific agriculture and of vital statistics based on these alone cannot be complete, consistent and final.

The importance of the solar radiations in the economy of the earth, and something of their and action, were presented to some extent in the last volume of *Agriculture of Pennsylvania*, in "Physics of the Atmosphere."

The purpose of the present note is to describe one or two very simple apparatus and methods of recording the time-quantity (*i. e.* hours) of sunshine. Such an instrument is called a *heliograph*, sunwriter. The sun writes the time during which it shines, either by burning a mark along a piece of common paper or by making a photographic trace on some kind of sensitized paper. The photographic apparatus gives more accurate results than the colorific, since the spot produced by combustion is quite large and the line burned may be continuous although short interruptions (as by passing clouds) may have occurred; or on the other hand, actual insolation may pass without record owing to a slight deposit of moisture on the paper or reflector.

The following two apparatus are so simple and inexpensive that almost any one may construct and use them. They belong to the photographic class of instruments. Keeping "sunshine records" would certainly be interesting to some one in each of many hundred homes of intelligence in this Commonwealth, and the records, continuously and intelligently kept would be valuable.

Dr. Maurer, of the Zurich Meteorological Bureau, has made a very simple and effective heliograph as follows:

Cut a cylindrical drum off obliquely at an angle equal to the latitude of the place, and cover the oblique end. Mark the longest diameter of the cover N S, N at top, S at bottom, and draw a line at right angles to the center of the line N S, putting W at its left end, E at the right. Cut a small aperture at the crossing of the two lines in the center of the cover. Close the other end, the bottom of the cylinder, with a removable piece kept in place by some simple catch.

Place the cylinder on an arm or base in such manner that the cover of the oblique end is horizontal, the line N S in the meridian and the axis of the cylinder parallel to the terrestrial axis.

The solar rays passing through the aperture describe in one day part of a circular right cone whose bore intersects the cylinder in a line forming a circle parallel to the lower end of the cylinder. Thus a sheet of photographic paper ("blue print" paper or "silver" paper) will have a trace marked upon it when the sun shines; and the part of the entire circle thus marked by the solar rays will indicate the part of the twenty-four hours of the day that the sun shone. The number of hours of sunshine thus obtained for any day can be expressed as a per cent of the number of hours that the sun is above the horizon for that day and place. Of course, the photographic paper when taken from the instrument is to be washed in order to remove the soluble salts from the parts unaffected by light.

Fig. I illustrates Dr. Maurer's heliograph.

In the Fourth Annual Report of the New York Experiment Station, Dr. S. M. Babcock describes heliograph in use at that station. Dr. William Frear of the Pennsylvania State College Experiment Station has also made and used this heliograph, which is of very simple construction. See Fig II.

A board four to six inches wide and thirty to forty inches long is attached to a base and upright so that when placed in the meridian it is parallel to the earth's axis. At the upper end of this inclined board is fastened a small box and near the lower end a reflecting sphere. This sphere may be made by taking a flask of good spherical body and covering the inside with black varnish and placing the neck of the flask toward the lower end of the board.

The sun shining on this spherical flask sends a reflected ray through a small aperture in that side of the box which is toward the flask; the center of the small aperture being at the same distance from the board as the center of the sphere. A conveying lens of short focus in the aperture will assist in bringing the rays to a sharp point near the aperture. On the opposite side of the box from the aperture is placed a sheet of sensitive paper "blue" or "silver." The sun's rays reflected during the day from the successive points of an arc on the sphere and passing through the small aperture trace an arc of a circle on the photographic paper, continuous or interrupted according to the condition of the sky. After removing and washing the paper, the hours of sunshine for the day are obtained readily from the part of the circle traced.

CHEESE POISON.

Some Facts of Popular Interest Concerning this Recently Discovered Poison.

By Prof. C. B. COCHRAN, *Microscopist of the Board, West Chester, Pa.*

Probably the most important discovery made during recent years in the field of chemical science was that made by Dr. V. C. Vaughan of a poisonous principle developing itself under certain conditions in milk or cheese. That some knowledge of this poison is not only of theoretical interest from a scientific standpoint, but is also of great practical importance I hope to make clear from the following brief exposition of the main facts now known concerning it.

So exhaustive and complete has been the work of Dr. Vaughan, that to him alone the world is indebted for nearly all that is known concerning this poisonous substance, therefore it is hardly necessary for me to add that the facts of this article are mostly taken from his investigations. The causes leading to the investigation and consequent discovery of this poison were as follows:

During the thirteen months beginning August, 1883, and ending August, 1884, there occured in different parts of the State of Michigan eight outbreaks of sudden and violent illness. Each outbreak involved quite a large number of persons, all of whom were attacked within a few hours of each other, and affected in a similar manner. These eight local outbreaks were all reported to the State Board of Health by the attending physicians. The cause of the sickness was clearly traced in each case to the eating of cheese, and further investigation fixed the cause on twelve cheeses, nine of which came from one factory, and the other three from three different factories.

With a view of learning the possible cause of the poisoning, the State Board of Health sent letters of inquiry to all places where there was any possibility of gaining information. The secretary also obtained samples of the poisonous cheeses which were sent to Prof. T. J. Burrill, of the Illinois State Industrial University, Dr. G. M. Sternberg, of the U. S. A., and to Dr V. C. Vaughan. After devoting all the spare time during more than one year of a very busy life, Dr. V. succeeded in isolating the poisonous principle of the cheese, which fact was reported to the State Board of Health.

One of the earliest printed reports of this discovery appeared in a German journal of physiological chemistry, edited by Hoppe-Seyler, Professor of Physiological Chemistry in the University of Strasburg. The article is entitled "A Ptomaine from Poisonous Cheese," by Dr. V. C. Vaughan. This letter was written November, 1885. The poison separated from the cheese was named by its discoverer Tyrotoxicon, from two Greek words, meaning cheese poison.

Tyrotoxicon belongs to the class of poisons known as ptomaines, and like other ptomaines is a product of decomposition or fermentation. The form of fermentation necessary in this case is known as butyric acid fermentation.

One can prepare tyrotoxicon by adding to normal milk some butyric acid ferment and then allowing the milk to stand in a warm place in a closely stoppered bottle for a period of eight or ten days. If the milk be then filtered, the poison will be in solution in the liquid which passes through the filter paper. This acid liquid is then neutralized with $Na_2 Co_3$ shaken thoroughly with a nearly equal volume of ether. On standing, the ether separates and forms a layer on the surface of the liquid just as oil floats on water. The ether can now be removed and allowed to evaporate when the tyrotoxicon is left as a crystalline residue. Having in this way obtained a supply of the poison, one can now study its physical, chemical and physiological properties The crystals are needle shaped, soluble in water, alcohol and in their present impure condition, soluble in ether, but when thoroughly purified, not soluble in the latter named liquid.

Milk or other fluid to be tested for tyrotoxicon should be kept in well stoppered bottles; for if the fluid be exposed to the air the tyrotoxicon may decompose in a few hours. When ready for analysis the milk should be filtered and the poison separated by the method already given, and the known tests applied.

Dr. Vaughan has very carefully investigated the physiological action of tyrotoxicon, both by experiments upon himself and his students and upon lower animals, and when these symptoms produced by the isolated poison are compared with the symptoms produced in the now very numerous cases of ice cream, milk and cheese poisoning that have occurred, we find them to be exactly the same.

In brief the symptoms of tyrotoxicon poisoning are as follows: nausea attended with vomiting, the vomit of a soapy frothy nature; griping pains in the abdomen, with diarrhœa; a sickening taste in the mouth, with a dry sticky feeling and great thirst; the throat and mouth seem filled with a sticky, ropy mucous; a sickening odor in the nose, such as belongs to the isolated poison; also, severe occipital headache; temperature below normal; heart beat feeble and very rapid; breathing hurried and labored; and, in very severe cases, pupils dilated not responding to light, constipation, no vomiting and perhaps stupor.

In the lower animals, violent retching, vomiting and watery stools follow the administration of small doses of tyrotoxicon. After large doses there is violent retching, but no vomiting or watery stools.

If a dose of tyrotoxicon sufficient to produce death be given to cat or a dog, or a smaller dose and the animal afterward killed, the mucous membrane of the stomach and intestine will be found white and soggy, and sometimes the lungs are in a state of congestion. Sometimes the circular fibers of the intestine are closely contracted. This condition is found after the administration of large doses of the poison, and in these cases, although there is violent retching, there is no diarrhœa, and usually no vomiting.

It is a well known fact that when milk undergoes the normal lactic acid fermentation, no such poison is produced. But it seems that if butyric acid fermentation be set up, tyrotoxicon is developed. This kind of fermentation is easily excited, especially in warm weather, when the milk is improperly handled or subjected to unclean and unhygienic conditions, or it may start in unhealthy milk even when treated in the best possible manner.

The following cases, illustrating the development of tyrotoxicon, are quoted from Dr Vaughan's reports, since they cannot fail to be of interest to every intelligent person who handles or consumes milk:

On August 7, 1886. twenty-four persons at one of the hotels at Long Branch were taken sick, on the evening of the same day nineteen persons at another hotel were attacked, and a week later thirty persons at another hotel. Dr. W. K. Newton and Mr. Shippen Wallace, analysts of the New Jersey State Board of Health, traced the cause of the illness to the milk, which, on analysis, was found to contain tyrotoxicon. The three hotels were all supplied with milk from the same dairy. The milk producing this illness was milked at noon and without cooling, carted eight miles in hot weather and delivered at the hotel, still containing its animal heat. After considering all possible causes, these gentlemen concluded that the development of tyrotoxicon was due to the fact that the animal heat was left in the milk for so long a time.

The second illustration of the development of tyrotoxicon in milk is taken from an article written by Dr. Vaughan, and published in the *Medical News*, December 3, 1887. The article is a report of four cases of tyrotoxicon poisoning with three fatal results.

"The family, which consisted of the four persons sick, and of a daughter about twenty years of age, who was away from home at the time when the others were taken ill, and for some months before that time, was evidently a tidy one. This was shown by their personal appearance, and by the clothing and bedding. But the house in which they lived was very old and very much decayed. Mr. Evans had purchased the farm six years ago, and for some three years past, at least, they had been troubled every now and then, one or more of the family, with nausea and vomiting, followed by more or less prostration. But in no instance, up to the present illness, had the symptoms been sufficient to cause them to summon a physician. The family had worked hard in order to pay for the farm, and had determined to make the old house do until they were out of debt. Even before this family had moved to the farm, the house had been known among the neighbors as an unhealthy one, and there had been much sickness and a number of deaths among its former tenants.

The house is a frame one, and one of the neighbors said to me that it was an old house when he came to the neighborhood thirty-seven years ago. It consists of two rooms on the ground floor with attic rooms above. The frame rests upon four large logs or sills, which lay directly upon the ground, and are thoroughly rotten. There is no cellar under any part of the house. From the front, at least, the surface slopes toward the house, and the rain water runs under it. In the floor of one room a trap-door had been placed, and directly under this a small excavation had been made for the purpose of collecting the rain water when it accumulated under the house. Although this pit was dry at the time of our examination, its sides and bottom were marked with cray-fish holes, showing that water had stood in it. The floor was laid of unjointed boards and every time that it was swept much of the filth fell through the cracks, and every time that the tidy housewife scoured and mopped the floor, the water, carrying with it the filth, ran through the crevices, and thus the conditions most favorable for putrefactive changes were brought into existence, and maintained.

One corner of the rooms had been transformed into a small room, or buttery, as it was called, and in this, on shelves, the food was kept. On account of the more frequent scouring demanded by that part of the floor enclosed in this buttery, the boards had rotted away, and a second layer of boards had been placed over the original floor. Between these two floors we found a great mass of moist, decomposing matter, the accumulations of years, which the broom could not reach. When this floor was taken up a peculiar nauseating odor was observable, and was sufficient to produce nausea and vomiting in one of the persons engaged in the examination. Some of the dirt from beneath the floor, and some of that which had accumulated between the boards in the buttery were taken for further study.

The condition of the house was supposed to be unfavorable to the patients, and for this reason they were moved, as Dr. Mesic has stated, to the house of a neighbor. Of course, thorough examination of the house was not made until the patients had been removed.

Special inquiry was now made concerning the food used by this family. They had been living very simply. They lived upon bread, butter, milk, and potatoes, with coffee and ripe fruit. They had eaten no canned foods for months. They ate but little meat. Occasionally a chicken was killed and served, and rarely some fresh meat was obtained from the village. During the week in which they were taken ill, all the meat used consisted of slices from a piece of bacon, the only meat which was kept in the house, and a chicken, none of the latter remained, but the bacon was examined. It seemed in perfect condition and contained no trichinae. Moreover, as has been seen from the history of the case, all the members of the family were not made sick by any one meal, but the opportunity of obtaining the poison must have been present for some time. Moreover, the fact that previous, similar, but less severe attacks had occurred at intervals for the past three years, convinced us that the poison must owe its origin to some long existing condition.

The drinking water supply was also investigated. The water was obtained from a shallow well, and some of it was taken for analysis. But several families had for years used water from this well, and had remained healthy.

The milk used by the family was studied. Of course, we could get none of that which had been used before the members of the family were stricken down. As soon as he made the diagnosis of tyrotoxicon poisoning, Dr. Mesic ordered the discontinuance of the use of milk, not only with the sick, but he forbade the daughter, who had returned, and any of the visitors using it. Mr. Evans owned four milch cows and they were supplied with fair pasturage and abundant water.

The greater part of the milk was placed in tin cans which were set in a wooden trough in the yard, and surrounded by cold water. The covers to the cans were arranged so that the air could have free access to the milk, and were left in this position until the milk was thoroughly cooled. Indeed, the cans were furnished by a creamery company, which followed the directions which I have previously given for the care of milk. On his first visit to me, Dr. Mesic brought some of the milk from one of these cans. This I examined, but failed to find tyrotoxicon in it.

However, the family did not drink any of the milk from the cans. That which they did use was kept in the buttery which I have described. Here it stood upon a shelf and some members of the family at least were in the habit of drinking from it between meals. This was especially true, it is said, of the son. He would frequently come from his work in the fields, go into the buttery and drink a glass or more of the milk. Mr. Evans states that he frequently observed that the taste of the milk was not pleasant. On my first visit to the premises, I advised that some milk should be taken from the cans, allowed to stand in the buttery over night and be sent to me the next day. This was done, and in this milk we found tyrotoxicon, not only by the employment of chemical tests, but by poisoning a kitten with it.

Tyrotoxicon has been found to develop rapidly in abnormal milk, or in the milk of deceased cows even when the milk is kept under the very best hygienic conditions.

I here quote the history of one case illustrating this fact:

"July 30, 1886, about 1 o'clock P. M., I was called to see the seven months' old babe of Mr. B. I found that the child had been vomiting quite constantly for some three hours. It had also passed watery stools some six or seven times. The eyes were sunken, skin cold and clammy, and pulse rapid and small. I diagnosed cholera infantum. During the preceding night, the child had seemed as well as usual, and had taken nourishment freely from the mother's breast. Early in the morning it had been given a bottle of cow's milk, and soon thereafter the nausea and vomiting began. Later, as stated above, the child began to purge. The mother, furnishing an insufficient supply of milk, it had been the habit to give the child cow's milk several times during the day. I prohibited the further use of milk, both that from the mother and from the bottle, and substituted meat preparations and rice water as foods. I also prescribed pepsin, bismuth subnitrate, chalk mixture, and camphorated tincture of opium.

"The cow's milk which had been furnished the child was from an animal kept by one of the neighbors. On the evening of the same day that the child was taken sick I obtained two quarts of the morning's milk of this animal. The milk had the appearance of very rich cream, being of a yellow tint throughout. This milk was allowed to stand through the night of the 30th in the ice-box of a refrigerator. On the morning of the 31st I began the anaylsis. After pouring the milk from the pitcher there remained in that vessel about two ounces of a fluid the color of port wine. Microscopical examination of this fluid showed the presence of pus and blood corpuscles. The blood was also detected by obtaining the characteristic bands of oxyhemoglobine with the spectroscope. The milk, which had already coagulated, was filtered. The strongly acid filtrate was rendered feebly alkaline with potassium hydrate and then agitated with absolute ether. After separation the ether was removed with a pipette and allowed to evaporate spontaneously. This residue was dissolved in distilled water and again agitated with ether. This ethereal solution left, after spontaneous evaporation, a residue which had a slightly brownish tint. I did not obtain the crystals of tyrotoxicon, doubtlessly owing to this trace of impurity; but the residue had the odor and taste of tyrotoxicon. This residue dissolved in some distilled water and given to a cat produced retching and vomiting.

"That tyrotoxicon was present in the milk taken by the child shortly before the beginning of its illness there could now be no doubt. It is true that the milk was abnormal in other respects also, inasmuch as it contained pus and blood.

"After the withdrawal of all milk and the use of the medicinal agents mentioned above, the child began to improve, and by the afternoon of August 1 it seemed so well that it was allowed a bottle of good cow's milk (from another animal); but soon after taking this milk it again began to vomit and purge. Milk was again withheld and the same medicinal treatment resorted to. This attack was slight, and after it the child continued to improve until the night of August 4, when the grandmother, who "knew more about raising babies than the doctor," fed the child bountifully upon milk. Again the vomiting and purging began, and it was more than a week before all symptoms of gastro-intestinal irritation had disappeared. About the 15th of August milk was again allowed, at first in small quantity, and this seeming to have no harmful effect, more liberal quantities were given. The child has continued well since.

"From the above observed facts I infer that not only the poison but the ferment, by whose growth the poison is generated, was introduced to the alimentary canal, that this micro-organism continued to live until some time after August 4, and when the milk was given the poison was again formed by the growth of the ferment. Whether or not any germicide could have been borne by the child in sufficient quantity to destroy the ferment I do not know."

Dr. Vaughan, in a carefully written article has pointed out the closest similarity between the symptoms of tyrotoxicon poisoning and cholera infantum. He has also shown that cholera infantum occurs when and where tyrotoxicon would most readily develop in milk. If the genuine cholera infantum is simply tyrotoxicon poisoning, physicians can now intelligently treat this disease. The mode of prevention and the curative treatment are clear, and as a result the infant mortality will be very greatly diminished.

With regard to the chemistry of tyrotoxicon very little has been said, as the object of this brief review is to prevent only such facts as are of popular interest. Suffice it to say that tyrotoxicon is not only the product of butyric acid fermentation, but it has also been artificially prepared and its chemical composition is well known.

WHAT DIRECTIONS CAN A GEOLOGIST GIVE FOR FINDING WATER?

By Prof. J. B. LESLEY, *State Geologist and Geologist of the Board, Philadelphia, Pa.*

I have put the question in its most practical form. It is one of those specific point blank questions which are put by different classes of people to a geologist wherever he goes. Every man who builds a house thinks a great deal before he begins to dig a well, for no house is good for much without a good well close at hand. A farmer may have a dozen fine springs on his farm, but he won't be satisfied until he has also a good well at his kitchen door. And by a good well he means not merely a well of good water, but a well that will never fail. A certain necessary steady quantity is as much, or more to him than quality. He would, of course, prefer bright, cool, pure water to drink and cook with, but he must have enough for the needs of his household, such as it is. Quantity is of the first, quality of the second importance. And by quantity he means the durability and regularity of the supply. The barn and the dairy must also be amply supplied, quality being in both cases again a secondary, although important consideration. In a word, every farmer wants to tap a little underground river, and bring some of it to the surface; so he asks the geologist, whose profession it is to know all that can be known about the underground, to tell him where the little river runs; or, if there be several, which one runs nearest to his house and barn, and exactly where must he sink his well to hit it, and not miss it.

The farmer usually puts the question to the geologist in that style, under the impression that the water he wants runs in a narrow streak or vein, and that he has about as poor a chance to hit it with a well as to hit a tree with a bullet if he fires at it with his eyes shut. If he could only see the water vein he wouldn't ask anybody's advice where to locate his well on it. The geologist professes to have a faculty of seeing underground, so the farmer, although he doesn't believe much in such a faculty, asks the geologist to direct him where to locate his well. And if there be no geologist handy, he may accept the advice of a professional man of another kind, who carries a musk bag, or a witch-hazel stick, or a magnet, and talks about attractions of various sorts. Indeed, very few farmers can discern any great difference between a witch-hazel man and a geologist. They both carry little instruments in their hands, and both of them pretend to see underground by means of their little instruments. For all he can tell the forked stick may have a sharper sight then the dipping needle, and the man who walks thoughtfully backwards and forwards over the ground holding it in a certain position until it twists itself downwards out of his fingers towards the water, may be a much better person to consult than the other man who only takes his observations here and there about the farm and talks about stratification. Stratification is a long and sonorous word, but it does not seem to mean anything very definite. But Elective Affinity, that is of the sap in the witch-hazle for the vein of water underground, is a longer and much finer expression, and seems to explain the whole business. In fact the explanation is entirely satisfactory. If you want to find a hidden treasure all you have to do is to cut off the right hand thumb and forefingor of a dead miser, fasten them forkwise at the end of a stick, and walk about until they point downwards toward the gold coins which they loved so dearly to finger. Why then should not the sap in a fresh walking-stick respond in the same manner to the presence of its beloved mother water in the ground?

I have great respect for witch-hazle water finders, because I believe that most of them, certainly all the successful ones, are really geologists, and find water on geological principles. The stick they hold in their hands is merely a sign of their profession, a sort of walking metaphor, although it does not go on all fours, and a very effective persuader to confidence in the oracle, among people who are not educated quite enough to shake themselves entirely free from the traditional superstitions of the Old World. And I am quite serious when I affirm my belief that witch-hazel men are, the best of them at all events, very practical geologists, and find water or give useful directions for finding it, because they have a certain kind of geological science at their command.

Geology can be learned at school and from books, in the laboratories and museums, by studying maps and sections, crystals and fossils. But such learning rather enlarges the mind than strengthens it. It suggests a great many ideas about nature, but does not make a useful geologist. Nothing but a study of rock strata in the fields and mountains can do it. The student of books must become an original observer and discoverer himself; must hunt up his own facts with his own eyes, and reason them out with his own good sense; must travel around and keep a sharp lookout, notice everything, and the relations of everything to everything else; handle, feel, taste, smell, crack open and pry into every stone in the brook, every bed in the cliff; follow every outcrop; measure its strike and dip; make a map of it; make a section of it; in other words *stratify* it with the beds on which it lies, and the beds which lie on it, so that he can tell mathematically, or rather geologically, where it goes to when it descends into the underground, and where it will come up again to the surface. In this way he learns to find the place of a limestone bed, or an iron ore bed, or a coal bed, and to calculate the depth of it beneath the surface at any given place on the map of a property. And just so he must notice the place between the rocks where every spring of water issues, to learn what are the water-bearing strata. When he finds that out it will be very easy for him to calculate the necessary depth of a bore hole, or a common well, to tap this or that water-bearing rock near this or that man's house.

Now the geologist openly confesses that this is *his* common sense style of work. I believe that the best witch-hazle men take this same common sense way to do their work in finding water; only they do not say much about it; and some of them, I know, are not entirely conscious of doing it in that way. But they do it that way, all the same, and they educate themselves very thoroughly for it. No man of ordinary good sense can keep going around hunting and finding water for people for forty years without becoming pretty good, in fact for water purposes a very good practical geologist, and a much better water geologist than any fresh graduate from the University of Pennsylvania can pretend to be, until he has obtained the same field experience in a similar manner. Then the student's previous scientific training will begin to tell, and if he has good brains, a clear, sharp imagination, sound reasoning powers, and attends strictly to business, he can get ahead of the best witch-hazle man, because he will know principles as well as facts, and can bring well established general truths to bear upon unexpected difficulties in any given case.

I wish to insist in this paper on the fact that stratification is the key note of the search for under-ground water, and if I can make this plain I can furnish a common-sense rule of wide application in Pennsylvania for locating a water hole or well. The rule will not work in all cases, because water does not always follow even a water-bearing stratum of rock, although it does so in ninety-nine cases in a hundred. The rule is a perfectly simple one. Notice the kind of rock at the outcrop of which springs issue and you can infer that water will be obtained wherever that particular rock is struck by a bore hole or well.

But it must be kept in mind that while water is soaking into, moving through, and issuing from a water-bearing stratum at its outcrop (freely when the rock is gravel or loose sand and with greater difficulty when it is a tighter rock) there is in some places a freer passage for the water through cracks which traverse a rock from top to bottom, and that it is often by virtue of the superior size of some one or other of these cracks that the place of a natural fountain or spring is determined at the surface. Such water-filled cracks or special water channels however are not, as people usually suppose, of the nature of under-ground brooks or little rivers. In fact, in many instances they play a very small part in the under-ground system of water movement. In many districts, or rather in many formations, they are accidents which can be neglected in discussing this question.

The great fact to be kept in view is that the whole of a water-bearing rock is full of water in all its extent lengthwise and crosswise from top to bottom and from the surface down to depths as far as the rock goes.

Consequently, even if there are but a few places at the surface outcrop where the water issues, a thousand wells going down to the rock will, all of them alike, share in the supply. When such a good water-bearing stratum underlies a man's field, the geologist will simply tell him that he may locate his well anywhere in that field and will get water. The witch-hazle man will be likely to make a mystery of the matter, and after going through a series of evolutions, will fix upon some exact spot. It is in making a mystery of the case that the quackery consists.

What is it that makes a water-bearing stratum? I answer: First, the porosity of the rock. It must be a loose deposit of sand or gravel lying on another deposit of clay or other tight material that will not let the water pass. The rain which fells upon the earth's surface runs partly off into the sea, and partly sinks through the soil and sub-soil into the under ground. Finding its way downward slowly through one stratum of rock after another, deeper and deeper, it collects in some stratum of sand or gravel rock loose enough to hold it as a reservoir, and then it spreads sideways in all directions, with greater or less slowness according to the porosity of the rock, being continually pressed by the weight of the water above towards every possible point of issue at the surface. If all the strata for a hundred feet down are loose sand rocks the water will go down the whole hundred feet and collect on the upper surface of some clay formation which stops its further descent. If the dip of the rocks be towards a valley and the edge of the clay deposit be exposed along the foot of the hills bordering the valley, water will be seen issuing in a row of springs at about the same level. If, on the contrary, the dip be from the valley into the hill still it will make no difference, for then the water, instead of flowing downward over the upper surface of the clay, will flow upward over the surface of the clay, and issue in precisely the same manner on the hillside in a line of springs, for in this case it does not flow by its own weight, but is pushed forward and upward by hydraulic pressure inside of the hill.

If however, the hill be a ridge between two valleys, and the dip of the rocks be from one side of the ridge to the other [that is, from one valley to the other], then more water will issue at the lower outcrop of the clay in the one valley, than at the higher outcrop of the clay in the other valley; because the force of gravity is added to the hydraulic pressure. If, however, the dip be very gentle, the difference of the issue of the water at the two outcrops will not be great; because in this case the force of gravity is of slight importance compared with the force of the hydraulic pressure. It can be readily understood that the farmers who cultivate the two slopes of such a ridge will have about an equal advantage in sinking for water; that is, will be equally sure of finding it, and will obtain an equally copious supply; provided always that the character of the water-bearing rock remains the same from one side to the other through the ridge.

I will give two or three practical instances of the way this structural or stratigraphical law of underground drainage works in nature.

Look at the geological map of Cambria county and you will be surprised to see how large a majority of the head springs of the brooks are located on the colored line which marks the bottom of the Barren Measures; or, what is practically the same, the outcrop of the Freeport Upper coal bed E. We have in this case as fine an illustration of the law of the water supply of a country as can be found in geology anywhere; and its explanation is perfectly simple. The Barren Measures are about six hundred feet thick, measuring from the Pittsburgh coal bed down to the Freeport Upper coal bed. The bottom fifty or one hundred feet of Barren Measures is the Mahoning sandstone, resting on the roof shales of the Freeport Upper coal bed. The Pittsburgh coal bed has been swept away from all Cambria county; so that the central upland region around Ebensburg consists of the middle Barren Measures. The annual rain-fall is perpetually working its way down through them and collecting in the Mahoning sandstone. It cannot descend further because of the roof shales and the perfectly tight fireclay floor of the Coal E. The hydraulic pressure of the descending water acting all the time on the water collected in the Mahoning sandstone, presses it toward the outcrops of

Coal E in all the valleys and ravines which cut down to and beneath it; and it issues in springs along that special geological line marked upon the map. It is evident without further explanation that in theory any farmer on the Barren Measures of Cambria county would get water by boring down to the Mahoning sandstone and especially to the bottom of it; and would find the supply as permanent as that of any of the springs which issue from the base of the Mahoning sandstone on the sides of the valleys. But, of course farmers cannot make deep borings or sink very deep wells; and therefore none of the farmers of Cambria county can take advantage of this particular water-bearing stratum at the base of the Mahoning sandstone unless their farms stretch down over its outcrop, low on the hill slopes.

How is it then, that the farmers on the Cambria hill country have springs and good wells? It is because the Mahoning sandstone is not the only water-bearing deposit in the Barren Measures; but only the principal one. There are three others higher in the series, the Saltzburg sandstone, the Morgantown sandstone and the Connellsville sandstone. Each of these receives its share of the rainfall; and delivers it at its outcrops. On the map therefore it will be seen that many of the brooks head up far in the interior of the Barren Measure region, and are fed by springs which issue from the upper sandrocks.

As it is extremely difficult for people who are not accustomed to the subject to keep in mind its innumerable complication I have tried to simplify my Cambria county illustration of it by describing the phenomenon as if the whole rainfall went down through the Barren Measures into the Mahoning sandstone and was stopped at Coal E. But the fact is that the Mahoning sandstone receives practically speaking only the rain which falls upon the sloping belt of land which intervenes between its own outcrop and that of the Saltzburg sandstone higher up. In like manner the Saltzburg sandstone receives that part of the rain which falls on the belt of land between its own outcrop and the outcrop of the Morgantown sandstone still higher up; and, as the Connellsville sandstone is swept away from most of the country, the Morgantown sandstone receives pretty much all the rest of the rainfall.

It must be remembered, however, that no water-bearing stratum is perfect. All rock formations are more or less cracked, and many of the cracks, although very narrow, descend through many strata, and cross each other, in such a way as to make the whole underground more or less pervious. Therefore, a part of the water in the Morgantown sandstone gets down into the Saltzburg sandstone, and even still lower into the Mahoning sandstone, which thus becomes the greatest reservoir of water in Cambria county.

I cannot pursue the supplementary and exceptional details further without wearying your patience; but what I have said will furnish a practical, general idea of the rainfall underground water supply of all western Pennsylvania; because, in western Pennsylvania, that is, from the Allegheny mountain to the Ohio and New York lines, the stratification is nearly horizontal; over large area the rocks lie practically flat, and the water-bearing outcrops run along the hillsides, and in and out the valleys and ravines at practically the same level. What dips the rocks have are exceedingly gentle; from 0 to 5; only along the flanks of Laurel hill and Chestnut ridge, do they reach anything like 20 or 30; and over tens of thousands of square miles they wave up and down with slopes less than 100 feet to the mile.

I will take another illustration from Crawford and Erie counties, in the north-western corner of the State, where the subcarboniferous formations slope south from Lake Erie towards the Allegheny and Ohio rivers at the rate of less than 30 feet in a mile, outcropping in successive belts one above another.

Three of these formations are the *First, Second and Third Oil sands* of Venango and Franklin counties; the water, oil and gas gravels of the oil region. But in their extension north-westward into Crawford county their character is so changed that they fail of being reservoirs of water, oil and gas to any notable extent. For the gravel beds of Venango become in Crawford and Erie fine-grained sandstones with shale.

There is a fourth formation, however, *the Corry sandstone* (the Berea grit of Ohio, the Third Mountain sand on Oil creek, and the First Oil sand in Butler county) which retains enough of its character towards its Lake Erie outcrop sufficiently well to be a water bearer; and to be in fact the *fountain horizon* of Crawford county. At Corry, where it is extensively quarried, one of the largest springs of the district issues from it; and a continued range of springs mark its outcrop for 30 miles. It is distinguished from the higher sandstones of the region by its yellowish-white or buff-gray tint, and its compact, fine-grained structure. In one or two places small colored jasper and white quartz pebbles are seen in it, and occasionally a few ill-preserved fossil shells. Its layers vary from 2 to 12 inches and are never more than thirty inches thick; and the whole formation is about 30 feet thick. It is evidently completely saturated with rain water under a great area of country, in spite of its fine grain. The explanation must be that it is traversed by innumerable fine cross-cracks or cleavage planes which permit the water to move in all directions towards the outcrop line, where it issues at the surface.

But an additional fact is necessary to make the explanation complete. It is this, namely, that the Corry sandstone lies upon a thin formation called the *Cussewago limestone*, only one or two feet thick, which has a glassy fracture, and in Crawford county contains no fossils. It is this limestone which stops the descent of the Corry sandstone water, and is the real water-bearing rock which produces the innumerable springs of the country.

Now any one can understand from the above description that in a country so undisturbed as Crawford county, all its rocks lying so nearly horizontal that the dip amounts to less than thirty feet in a mile, with no anticlinal rolls, and no faults of any kind, so far as we are aware, a geologist finds it the easiest thing in the world to tell how deep a farmer must sink his well through the *Corry sandstone* to the underlying *Cussewago limestone* to get what water he wants. As to the quality of the water, it is only necessary to taste the nearest natural spring at the outcrop, for the water in the well must necessarily be of that quality. As to quantity, a careful estimate of the average flow from two or three outcrop springs in the neighborhood will come near the truth, for the Corry sandstone, being everywhere much of one character, the movement of the water through it may be regarded as nearly the same everywhere, so that the delivery into a well will be about the same as the delivery from a spring.

Let us now transfer our attention from the undisturbed geology of western Pennsylvania, to the uptilted and folded region of middle Pennsylvania, and we lose at once the simple rules of water finding which I have described. The geological principles remain the same, but their application is changed. The rainfall penetrates the surface indeed in the same way; but it descends readily and rapidly through the upturned and broken gravel and sand rocks of coarse grain and loose texture, than through more compact rocks. The descending water is here also arrested or directed in its course by the clay shale strata and keeps on down through the sandstones which lie against the shales. Springs issue along any line of outcropping sandstone overlying shale; but the steep dip confines the springs to the lowest surface levels, that of the brooks which have cut cross valleys and ravines. The depth of any well to strike a given rock is greatly increased; and the problem of its proper location therefore becomes a matter of vertical and horizontal measurement.

The fossil ore beds of middle Pennsylvania furnish a fine illustration of how the rainfall drains downward through steeply dipping rocks. Every miner who has worked a bed of fossil ore knows that it yields two very different kinds of ore, not mixed but in separate parts of the mine. At the surface and for a variable distance down the miner gets soft ore; and then he comes to hard ore, and will continue in hard ore as much further down as he chooses to go. This difference between the *soft ore* at the surface and *hard ore* in the underground has been produced by the chemical action of rain water acting on the carbonate of lime in the ore bed. It proves that rain water percolates in every direction through every rock stratum. The fossil ore is so called because it holds myriads of small fossil shells. From the soft ore these shells have been dissolved and carried away by the rain water or the carbonic acid which it holds. In the hard ore the little white shells remain unchanged. It follows as a matter of course that we can tell the depth to which the rain water descends in a fossil ore bed, by remarking the line made by the bottom of the soft and the top of the hard ore. The mouths of most of our fossil ore mines are in gaps or in ravines which descend from a mountain and cut through the ore ridge, exposing the steeply dipping bed. Such ravines recur at intervals of half a mile or more along the flank of any given mountain; and between the ravines the mountain slope projects into the valley in a series of spurs. The line of ore crop runs along the mountain side, dipping into the ravines and arching over the spurs. In other words the ore crop starts in the bed of a ravine, rises over the first spur, and descends into the next ravine, and so on, the whole length of the mountain. Usually the outcrop on a spur is two or three hundred feet higher than in the ravines on each side of it, where the lowest springs issue from the ore bed, and often occasion its discovery.

The ore in the ravines in all cases with very few exceptions is soft ore. This shows that the rain water falling on the spur descends in the ore bed, at least as low as the bed of the ravine on each side of it; that it descends still deeper, is shown by the fact that a slope sunk in a ravine usually gets soft ore for an uncertain small number of yards beneath the valley. Such slopes, however, are seldom sunk. A bed is commonly mined by driving a horizontal gangway from one ravine through the spur toward the next ravine. Now the point to be noticed is, that such a gangway, started at water level in a ravine, gets soft ore until it gets well under the spur; gets hard ore under the middle of the spur; and then, if continued, will pass through soft ore again until it comes out in the next ravine. What does this show?

It shows that the rain water from the outcrop descends to a less distance in the middle of a spur than on its slopes in the ravines. In other words the general movement of the water is diagonally downward and sidewise toward the two ravines. There is, in fact, in the bed itself, a secondary water-bearing drainage-plane, in the shape of an arch from one ravine to the other.

I have described this particular case of a fossil-ore bed in detail, and with minuteness, as a perfect illustration of the general principle of underground rain-water drainage; a principle which holds good everywhere, and in all cases, and is the only guide to the geologist, giving him a basis of calculation for those parts of a country where the stratification is regular, no matter what the dip may be, flat or steep; and where the strata are alternately of different characters, some of them tight and some of them loose, some of them permitting the drainage to descend through them and others refusing to do so. In all cases the rainfall descends through the porous rocks, upon the fact of some clay-shale, tight limestone, or other underlying impervious rock.

But now an important new element must be introduced into the discussion of the subject, namely, that of the *lowest issue level*.

To make this plain, I must go to the limestone valleys of middle Pennsylvania, or better still, to the great valley in which Allentown, Harrisburg and Chambersburg are situated.

It was necessary for me at one time to devise some method of calculating the depth of the brown hematite deposits in this valley; and in doing this I was obliged to apply the geological principles of underground drainage to a special set of circumstances. It is well known that the brown hematite ore deposits owe their origin to the action of rain water, in the same style, but in a different way, as does the soft ore of the fossil ore beds.

The two most striking features of the limestone belt ot the great valley are: First, its peculiar orange-colored, loamy soil, of exceptional fertility; and second, the absence of surface-water and a barrenness of springs and brooks.

The first of these facts is due to the superior solubility of all magnesian limestone strata; and the second is due to the ready absorption of the rainfall by the soil and its immediate passage downward through innumerable fissures into numerous underground caverns.

The limestone of the Cumberland valley is several thousand feet thick. Its upper part, the Trenton formation, outcropping along the middle line of the valley, descends beneath the slate belt which makes the north-western half of the great valley. This Trenton formation consists mostly of strata of pretty pure limestone. The underlying middle and lower divisions (Chazy and calciferous) consist of two or three thousand feet of strata charged with magnesia, or rather, I should say, of alternate beds of nearly pure limestone and nearly pure dolomite or magnesian limestone. The chemical action of rain water holding, as it always does, carbonic acid, is greater upon magnesian limestone than upon pure limestone; which explains why, from the general orange loamy soil, massive outcrops of pure limestone project like reefs in the cultivated fields. Now, all the limestone beds of the great valley have been steeply uptilted, and often tightly folded together, contorted and disjointed in myriads of cross fractures. The rainfall sinks from the surface to the underground through these innumerable fissures, and continually widens them by dissolving their walls, so as to produce in fact a system of ramifying caverns in which brooks and rivers flow far beneath the surface. These are enlarged from year to year, from age to age. The sink-holes, which are so numerous in the surface of the valley, mark places where the roofs of these caverns have given way, more or less, and by these sink-holes much of the rainfall finds its way immediately into the cavernous region beneath. In all these caverns deposits of surface loam take place.

The surface of the Great Valley was once much higher above sea-level than it is now. The lowering of it to its present level has not been accomplished by any movement of the earth's crust, but by the slow perpetual chemical action of the rainfall. In all ages it was made cavernous by the same process. Ancient caverns filled with clay, holding a large percentage of concentrated iron (brown hematite iron-ore) and in old times deep underground, are now exposed to air at the present level of the surface. Those ancient caverns, are now open quarries. Some of them are mined as open quarries to depths of even 150 feet, with ore still in the bottom. Miners ask geologists how deep these deposits are. Geologists reply: we must find out how far down the rainfall descends in the limestone underground. But now, it is evident that rain-water will descend no further than it can find some side issue. It is equally evident that this will be determined by the level of the lowest springs of the country, in the beds of the deepest water courses of the valley.

A glance at the map of Pennsylvania will show that the Great Valley is trenched across by the Delaware, Lehigh, Schuylkill, Susquehanna and Potomac rivers, at a present level of 200 or 250 feet above the sea. But between these rivers the limestone country has a maximum level above tide of 500 to 700 feet. If therefore we suppose a perfectly free underground drainage system through caverns and fissures between the rivers, the rain-fall will stop in its descent at about the level of 200 or 250 feet above tide; that is only 300 or 400 feet beneath the highest divides. But if the underground drainage is at all obstructed, there must be a slope towards the river beds, so that the rain-water descends nowhere more than 200 or 300 feet from the surface vertically. This then may be assumed as about the lowest limit of ore in the deepest of the brown-hematite ore banks.

I have not attempted to discuss the subject in a precisely accurate scientific way, my intention is rather to state the case, and make a picture for the imagination in general terms, so that the principles of water-drainage involved in the phenomena can be understood. The right conclusions can be drawn without trouble.

The first conclusion naturally will be, that in a limestone district the striking of water is a matter of complete chance, seeing that the water does not follow stratified beds, but follows cracks, fissures, chasms and caverns of all widths and depths running in all directions but chiefly lengthwise of the more soluble strata. There is no similarity whatever between this state of things and that which I have described already, in the undisturbed horizontally stratified country of western Pennsylvania.

Another conclusion is, that the probability of a bore-hole 200, 300 or 400 feet deep getting water, in a limestone district like the Great Valley, is always very great; while the expense of boring to this depth is comparatively small. The quality of the water, however, will always be that of a limestone spring, more or less magnesian, with an infusion of iron.

I have taken the Great Valley as an example of this kind of water drainage. I might have illustrated it [but not so well] by the Little or Chester Valley, in which Dowingtown and Conshohocken are situated; but in this case the limestone beds are somewhat less disturbed; Those next the North Valley hill sloping southward at various angles; those in the middle of the valley much plicated; and those near its southern edge, the South Valley hill, turned up vertical and changed to white marble.

In the Connsville Cove of Fulton county, and in Nittany Valley and Morrison's Cove of Centre, Huntingdon and Blair counties, the limestone formation is at least 6,000 feet thick, and arched in such a way as to present dips both northward and southward, varying from the horizontal nearly to the vertical. The western extension of the Nittany Valley [called Sinking Spring Valley] in Blair county, exhibits water drainage phenomena in a very striking way. It shows the different degress of solubility of the purer and more magnesian limestone remarkable well. The uppermost thousand feet [Trenton limestone] outcropping along the foot slope of the mountain, is of nearly pure limestone. From under this, crop out the upper magnesian limestones, which suffer most from the chemical action of rain-water. In the outcrop belt of these extra-soluble strata we see Sinking creek following in a deep trench and through a number of natural tunnels. The trench and tunnels taken together were once a continuous cavern, dissolved out of these upper magnesian limestones. The drainage continues to flow in the cavern where its roof has not yet fallen in. Nothing is more picturesque than the great archways, into which, and out of which alternately Sinking Creek flows; and no better example of the action of rain water upon limestone can be found in the world.

I must now transfer your attention to another and entirely different geological region of the State, that of the most ancient granite, gneiss, and mica-schist formations. These form indeed the deep floor of the whole State; but they only appear at the present surface in the mountain ridges between Reading and Easton; in the South mountains of York and Adams counties; in the Welsh mountains of Chester; and in the southern belt extending from Trenton past Philadelphia to Harper's Ferry on the Potomac.

In these most ancient rocks we have no definite system of water drainage whatever. Through immense ages these rocks have been subjected to every kind of influence, water, heat, pressure, magnetism and chemical affinity, so as completely to change their original characters. They are now crystalline or semi-crystalline, whatever they were once. Some of them have issued from the deep in the condition of molten lava. All of them are so pressed together, contorted, distorted, fractured, faulted and re-cemented, as to disguise in a great measure or obliterate their original planes of deposit.

The rainfall finds its way down through this mass with the greatest difficulty, and to a very moderate depth; making its way slowly through an infinite number of cracks and meeting with no reservoirs in which it can collect.

The finding of water in such a region is therefore purely accidental and subject to no known geological rule of practice whatever. Nor can any encouragement be given to those who desire large quantities. A few so called artesian wells have been sunk in these ancient rocks, but they have necessarily proved failures. On the other hand, natural springs in such a region are very numerous, but all of them are very small; nor can any water be got, in any region of these ancient rocks, by a bore hole of any depth whatever, in quantities exceeding that of the natural springs of the neighborhood. On the other hand what water is got will be of the purest quality, seeing that there is nothing left in these ancient rocks to be dissolved by the rain water.

I have still three regions of the State to mention: First, the New Red sandstone or Trias belt; second, the great northern drift-covered country, and, third, the river gravels, sands and clay beds of the Delaware valley. Each of these three regions has a water drainage system of its own, and I will discuss them in succession and in the fewest possible words.

1. The New Red formation is old; not so old as the coal measures but older than the Cretaceous and Tertiary rocks of southern New Jersey, which lie upon its upturned edges. It consists of a bottom conglomerate, over which lie several thousand feet of brown building stone strata and reddish and gray shales. The whole formation is many thousand feet thick; and its beds have a nearly universal moderate dip [5° or 10°] toward the north, north-east and north-west. The exposed beds of this formation can be studied for thirty miles along the Delaware river, and for fifteen miles along the Schuylkill. The formation covers the larger part of Bucks and Montgomery counties, and stretches in a continuous but irregular belt through Chester, Lancaster, York and Adams into Maryland and Virginia. Although much more homogeneous than the older formations, still there is an alternation of comparatively loose sandstones and comparatively impervious shales. Consequently there are a large number of water-bearers, and therefore, all that has been said of the underground water drainage of Western Pennsylvania will hold theoretically true of the New Red belt in south-eastern Pennsylvania. The formation has also been subject to many violent earthquakes in the past ages, some of which have gone to the extent of faulting the beds to considerable distances; and the whole mass is visibly cracked in definite directions. It is chiefly these cleavage planes that permit the universal movement of the rain water through the mass to a moderate distance beneath the surface, whence it finds its way horizontally to issue in springs along the banks of the Delaware, Schuylkill and Susquehanna rivers, and their numerous side branches.

But there are no strata in the Trias to make a reservoir, and therefore artesian wells will never be successful anywhere along the New Red belt; nor will any unusual supply of water be obtained from wells, even when sunk to a depth of 200 or 300 feet. Certain noteworthy copious wells in the New Red of eastern New Jersey, which I discussed in a previous report to the Board, exist under circumstances which do not occur in Pennsylvania. Their supply comes from a very large surface reservoir of exceptional character, which I need not now describe. A description of them can be found in the reports of the New Jersey Geological Survey.

The limits of the New Red belt can be seen on the geologically colored maps of the counties above mentioned, published by our own survey. Its southern edge runs, for instance, through Norristown and up French creek, in Chester county. Its northern edge follows the southern slope of the Durham and Reading hills; passes the Cornwall iron ore mine in Lebanon county; across the Susquehanna a few miles below Harrisburg and follows the foot of the South Mountain into Maryland.

2. The great drift-covered area of north-eastern and north-western Pennsylvania, has a very peculiar water drainage of its own. All the counties of the State lying north of Belvidere on the Delaware; White Haven, on the Lehigh; Berwick, on the North Branch, and Ralston on Pine Creek, are covered with a sheet of rocky trash (sand gravel and boulders of all kinds), which the great Canadian glacier brought into our State in the ice age. In Western Pennsylvania parts of Warren, Venango, Butler, and Beaver, and all of Lawrence, Mercer, Crawford and Erie counties are covered with the same northern drift. The ancient valleys are filled with it to the depths of from 100 to 400 feet; and over the high lands it is spread to a depth of from 10 to 100 feet. The general average thickness of this vast surface deposit may be stated at about 50 feet. It is an unstratified sheet of sand and gravel, with local layers of clay, overlying and concealing the edges of the older formations and it incloses an immense number of ponds and little lakes of various sizes and shapes.

The rain water which descends upon this great drift-covered area is received by it as by a sponge; and comparatively little flows off directly into the sea, excepting in the times of heavy rains, and the rapid melting of snow in the spring. The rest of the annual rainfall percolates raidly through the bottom of the drift, and issues in an infinite number of small perpetual springs. Any man can obtain water anywhere in the drift-covered counties of Pennsylvania, by sinking a well. He is perfectly sure of a share, certainly a small share, of the water with which it is forever kept full. But the quality of the water is peculiar as the northern drift is composed of every species of known rock, of every age and quality, granite, sandstone, slate and limestone, broken up, ground more or less fine and dumped together, the chemical action of the rain water on the more soluble portions, affects its taste both in the springs and wells so much as to be unpleasant to those who have been accustomed to drink pure mountain sandstone water. Almost all the drinking water ot New England is drift water and has this peculiar taste.

3. The river gravels and sands, with brick clays, in the terraces of the Delaware river valley above and below Philadelphia are in the main derived from the northern drift, *i. e.*, brought down from the drift-covered country of the upper Delaware, rolled in its passage southward, and re-deposited when the Delaware river had a higher level than it has at present.

Half a century ago any householder in Philadelphia could obtain a good well of water at a very moderate depth, several water-bearing gravels underlying the city. They are separated from each other by intermediate deposits of clay which hold the water to the gravels.*

In sinking the deep foundations of some warehouses and public buildings vast springs of water have been started, some of them adding to the expense of laying foundation walls. This shows the copiousness of the supply. It also shows the ease and rapidity with which the rain water passes in all directions through these gravels. The old wells of the city have fallen into disuse for many years, and some of them have been converted into cesspools, so that it would be dangerous now, in a medical point of view, to drink any water passing under Philadelphia.

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*I have known instances of wet cellars being made dry by simply digging a hole through the hard pan cellar floor a few feet thick into the next underlying stratum of gravel.

The exit from these city gravels is, of course, into the Delaware river, either directly or through the still more modern gravels of the actual bed of the river. The present depth of water in the Delaware river is no gauge to the depth of the bottom of the Delaware river valley channel. The present river flows over a very deep deposit of gravel, sand and mud burying up a valley channel several hundred feet deep. Of course the river keeps these deep deposits of the present day perpetually soaked with water, which at Philadelphia is nearly fresh, but becomes brackish at the head of the bay. Artesian wells, improperly so called, have been bored on the banks of the river in Chester county, to obtain a large supply of water from these under-river gravels; but, while the quantity is practically inexhaustable, the quality is that of the river water itself.

It is needless for me to speak of the Cretaceous and Tertiary rocks of southern New Jersey, in which so many genuine artesian wells have been successfully bored, because the Cretacious comes into Pennsylvania only in the bend of the Delaware below Trenton and occupies but a few square miles.

I have now practically exhausted my subject, so far as it has a geographical aspect and a practical bearing upon the wants of the community, especially the farming population of the State. Undoubtedly it will be felt that I have, after all that has been said, furnished no definite rules for finding water. In fact I have shown that no such rules are universally applicable. Every region has a water system of its own which obeys a special local law, chiefly of stratification, and every neighborhood will be found to require a special application of some more extensive law applicable to a whole region. Nothing but a close study of the geology of the farm, the borough, the township, the belt, the region, will answer the purpose of intelligent instruction for those who are seeking a water supply in any given case.

Note 1.—The great *downthrow faults* which ancient earthquake movements have produced in the crust of the earth, many of them thousands of feet in vertical extent and many miles in geographical length, play a great part in the system of drainage. It may be said in general terms, omitting exceptional cases, that all the great mineral springs of the world are ranged along such faults. The mineral springs of Virginia are celebrated examples. It is impossible that a whole country of rock shall be split to a great depth and moved, one part up and the other part down, along a line of fault without leaving the walls of such a fault irregularly pressed against each other, so that the fault becomes in fact a grand water way, down which the rain water is perpetually descending in some places and ascending in others in obedience to the laws of hydraulic pressure. Such faults as are more or less open fissures to the depth of several miles, permit the rainfall to reach depths at which the water can be heated by the constant high temperature of the deep underground, and wherever it reascends to the surface we have one or more hot springs. The copiousness of these hot springs depends on the openness of the fault along the line of which they are situated, and also upon the strong contrasts of height or levels above tide of the surface of the ground across which the line of fault can be traced. In this way the geologist can discover concealed faults and lay down their course upon the map by correctly placing upon it the natural springs arranged thus in straight lines. A beautiful example of this may be found at Three Springs in Huntingdon county, west of Orbisonia. The fault on the line of which these three springs are situated is described in Mr. Ashburner's report in volume F of the Survey, with a specially colored map, showing the extent to which the formations are thrown on one side of it, past the corresponding rocks on the other side, about 1,100 feet. Professor Lewis has used the same method of locating the faults in the New Red country in Bucks and Montgomery counties. We hope by this means, namely, by locating with accuracy the natural springs of that district, many more of the concealed faults in the New Red belt, to greatly diminish the extravagant apparent thickness of the New Red formation. The great fault at Codorus creek in the Doylestown district exhibits finely one of the methods by which the great faults of the crust of the earth have been made grand water courses. The two countries moved upon each other along this great fault were under such tremendous pressure that they have crushed the two faces of the fault into an almost indistinguishable mass of broken material 50 feet thick, more or less vertical stratum many miles in length and probably in depth, of so incoherent a consistency as to take and pass water like a sponge. Of course, along the surface outcrop of such a line of broken rock edges there will be a range of comparatively large natural springs of water. If a fault of this kind instead of descending vertically should slope at a moderate angle in one or the other direction, deep bore holes on the slope side would make very good artesian wells; but we have no certain rule for determining the directtion and amount of slope of such a fault and it must therefore be discovered by actual experiment, namely, by test borings.

Note 2.—The water drainage of all *river gravels*, sands and brick-clay formations is established on the same basis; but every large river has an individual character, different from that of every other river in the world. Each large river drains some special geological territory, from which the annual rainfall supplies it with its own special kinds of gravel, sand and clay. Some rivers are bordered by terraces of this loose material; others keep their channels very clean and exhibit no terraces at all; the majority of rivers have a character intermediate between these extremes. The terraces of the Delaware from Trenton down, lie at several different levels above its present bed, the highest being that of the Bryn Mawr gravel at about four hundred feet above the tide. The Susquehanna river from Sunbury down, instead of flowing over a filled up ancient deeper valley channel, flows almost the whole distance over a shallow rocky bed; but its two great arms the North branch and the West branch are terraced in a remarkable manner as described in the reports of the survey. The Juniata also has its terraces, but again of a peculiar and special character.

The finest terraces in the State are those of the Monongahela, Allegheny and Ohio rivers. The Monongahela valley has twelve terraces one above the other to a height of more than one thousand feet above tide, these are described in Prof. Stevenson's reports on the south-western counties. The Potomac in western Maryland exhibits magnificent gravel terraces to a considerable height above its bed, especially at Piedmont. A most interesting geological history is told by these terraces, into which I cannot enter in discussing the subject of water drainage.

THE MAINTENANCE OF FERTILITY.

By Prof. WM. FREAR, *State College, Centre county, Pa.*

The four things needful for the successful growth of any crop are, good seed, a good season, good tillage, and a fertile soil.

Among all the building materials used by the plant, it takes only two directly from the atmosphere—carbon and oxygen. All other substances necessary for its growth it takes from the soil. Although many substances are found in plants, it can be said with certainty that they are not all essential. Carbon, oxygen, hydrogen, nitrogen, sulphur, phosphorus, iron, lime, magnesia, potash and probably chlorine and soda, have proven indispensable. Large as the number of essential building materials is, the counterpart is found in the fact that, although soils vary greatly in composition, there are few that do not contain all the substances essential to plant growth. If this were not so, a large part of our globe would be an uninhabitable, arid waste.

While these plant ingredients are present to some extent in nearly all soils, their proportional quantities are far different from those found in the vegetable kingdom. So that some which are present in relatively large quantities in the plant, may be found in very small quantities in the soil. When they are present in the latter in too small a proportion, the plant roots are not able to secure the material necessary to make a good crop. Agricultural practice has shown that with few exceptions those soils that are regarded as at all fit for cultivation, rarely lack any plant food, except potash, phosphoric acid and nitrogen, and if these be supplied in such condition that the plant can use them, fertility is assured. Therefore the fertilizing problem resolves itself into the problem of securing and maintaining in an available condition in our soils the requisite proportion of these three substances.

To understand clearly the nature of this latter problem, it is necessary to keep in view the principal facts concerning the formation of soils and the feeding habits of plants. Soil is only a soft scale or crust that has formed on the surface of the rocky masses of which our globe is made, just as rust forms its soft, powdery coating on the polished surface of the hardest steel. The oxygen and carbonic acid of the atmosphere, the percolating waters, the alternating heat and frost, the driving winds, and the lichens and rootlets are all constantly dissolving and splitting off the exposed portions of our hardest rocks. Even when rock is covered by many feet of soil, it is not free from the attacks of water, and the substances which it holds in solution. The finely divided particles thus separated, combined with the remains of succeeding generations of plants, with the dust and the nitrogen compounds brought down from the atmosphere, and with the mineral substances in the water brought up from the rocks below by capillary action and deposited upon the surface by evaporation, constitute what known as *soil.*

Soils, therefore, must vary in composition much as the rocks from which they are formed, and according to their nearness to the surface, where alone plant life is possible. Thus, we find that granitic rocks yield clay soils containing considerable potash, while limestone soils contain relatively large quantities of phosphoric acid. In general, also, the soils containing the most organic matter, or humus—the acumulated remains of previous plant growth—contain the largest quantities of nitrogen. This substance is drawn originally from the atmosphere, where it exists chiefly in such a form that it does not readily combine with the other substances entering into the composition of the plant. It is, however, very gradually converted into nitric acid and ammonia, which are brought to the soil in solution in rain-water, and thence taken up into the plant. Contrary to a general supposition, we have no evidence that any plants are able to take nitrogen, except in very inconsiderable quantity, directly from the atmosphere. It seems possible, from recent discoveries, that the soil may be able to combine with small quantities of the free nitrogen of the air. These statements afford a knowledge of the origin in the soil of the three most important fertilizing substances.

Warington says, in speaking of the quantity of these three substances that may be present in the soil: "The surface soil (first nine inches) of a pasture may contain, when dry, 25 per cent. of nitrogen; that of a good arable field, 15 per cent.; a clay subsoil, 5 per cent. A good surface soil may contain 20 per cent. of phosphoric acid and often less. Potash varies much, rising to 1 per cent. or more in some clay soils, but generally being much less." To calculate the weights represented by these figures, it is necessary to recall that the first nine inches over an acre of pasture weigh, dried and free from roots, 2,250,000 pounds; and of arable soil, 3,000,000 to 3,500,000 pounds.

Small as are the quantities of these essential building materials present in any soil, their relative importance as fertilizing agents is made far more prominent by the fact, that probably only a very small fraction of even these small quantities is in condition at any one time to be taken up by the plant. For, in order that these materials may be available to the plant, they must be soluble either in the soil-water or in the acid moisture upon the rootlet surfaces. But much of the potash in the soils is contained in compounds that are insoluble or only slightly soluble in the carbonated soil-waters or the plant juices; much of the phosphoric acid, too, is present as the difficulty soluble phosphate of iron or alumina; while most of the nitrogen exists in the form of organic compounds, which slowly decompose in the soil to form the soluble nitrates, but which, as they stand, yield absolutely no sustenance to large classes of plants.

The term "available" is purely relative. Long-lived, hardy, large-leaved, and deep-rooted plants may live where others die. Further than that, there seem to exist positive differences in the power of different classes of plants to attack the same food material. Thus, wheat and related cereals seem to have a greater power of decomposing silicates than do numbers of the leguminous class, to which clover, peas and beans belong; while the latter, in turn, exhibit a power of utilizing the nitrogen in humus that cereals do not possess; and turnips have less ability than some other root crops to provide themselves with the necessary phosphoric acid.

It is desirable to bear in mind in this connection certain other facts relating to the abilities of various classes of soils to retain such amounts of phosphoric acid, potash, and nitrogen as may come to them from natural sources, as in the rain and in the water percolating from neighboring high lands,—either as surface or as spring water,—or in that brought by the capillary tubes of the soil, to supply loss from evaporation, as well as from those materials which may be added by the farmer. Investigation has shown that phosphoric acid, potash and ammonia are rarely found in drain water, but that nitrates are carried off in great abundance from loose, bare soils during the winter and spring. Clay soils containing iron have the power of holding all the three materials first mentioned, and humus has a great absorbent power for ammonia. To insure the retention of the latter, when added as muriate or sulphate to soils destitute of carbonate of lime, it is necessary to add this substance. It is important here to remark, that a large quantity of the organic nitrogen of the humus is changed into nitric acid during the summer months, and that this change occurs most abundantly in moderately dry soils containing a fair portion of carbonate of lime. From these statements, it is clear that leaching will cause comparatively little loss, unless in the case of nitrates, from heavy clay soils, or from those in which humus abounds, even though they are bare during the winter, while from a loose, gravelly, or sandy soil, winter rains and melting snows may wash away a large proportion of the available plant food.

Having observed the methods by which soil is made from rock through natural agencies, and the possibilites of loss of plant food in the drainage water, it is necessary to note, that under natural conditions soils are constantly growing more fertile, but that wherever agriculture has been practiced, without the addition to the soil of fertilizing materials from without the limits of the farm, fertility, in spite of the most thorough tillage, has, often slowly, but not less certainly, diminished until the land no longer yielded a profitable crop.

Every farmer is well aware that the rate of exhaustion will depend very much upon the product removed from the farm. There are two elements in the effect of any crop. The first is the relative ability of the plant to convert the soil constituents, with which it comes into contact, into organic material, together with the relative proportion of the whole plant left in the soil as root material that is soon made available to succeeding crops. The second element is the amount of plant food removed in the crop. The importance of keeping both these elements in view is shown by the fact that clover, although its top when cut for hay contains much more nitrogen, potash and phosphoric acid in an acre's yield than does timothy, generally leaves to the surface soil, in its roots, a greatly increased legacy of available mineral and nitrogenous food. The differences in the root residues of various crops very seriously affect the economy of their production.

In a few cases is a whole crop sold off the farm. In general, the amount of available material removed is less when the product is taken off in the shape of grain rather than straw; of meat than grain; of fattening stock than of growing stock; of pork than of beef and mutton; of butter or cream than of milk or cheese. It is further true that the cash product of the farm is either grain, or is obtained largely by the consumption of grain. Now the grain contains less of mineral ingredients than the straw, but yet holds a large proportion of the nitrogen and phosphoric acid of the total crop, and less potash than is found in the straw. The consequence of these facts is, that the general tendency on nearly all farms is to remove phosphoric acid and nitrogen faster than potash. It is theoretically possible to grow crops and convert them on the farm into butter and fat meat, and thus maintain nearly the same relation of loss and gain of the three principal fertilizing ingredients as occurs under natural conditions. But the laws of supply and demand prohibit the general adoption of such a system. The maintenance of fertility holds an importance secondary to the maintenance of human life and comfort. Indeed, it may rather be said to have importance only with these latter ends in view.

Since a loss in fertility is in the end inevitable for all cultivated soils, because of the available food material lost in the crops and drainage water is greater than the increase produced during the same period by the natural causes mentioned in the earlier portion of this paper, the necessity is apparent, if fertility is to be maintained, of employing some means to assist these natural agencies in keeping up the balance of available plant food.

Obviously, the first step is to diminish waste. To grow those crops which give the best economic results with the least expenditure of fertility; to avoid loss by drainage by keeping the land covered as far as possible with growing crops; to expose the soil as much as possible to those influences tending to increase the availability of its constituents—by thorough plowing, cultivation and drainage; to pay special attention to the management of the manure pile, compost heap and house sewage.

Among the ways of increasing the balance of fertility, the following are the more important: First, two methods in which natural causes tending to increase fertility are depended upon for the effects produced. Of these, the first in natural order is *fallowing*, which consists in breaking the soil so as to expose it to the influence of the weather for some time, meanwhile keeping it free from both crops and weeds. By this method, compact soils are rendered more porous. The atmospheric agents increase the amount of available mineral ingredients, and the insoluble, nitrogenous, organic matters are converted into soluble nitrates. In the dry season, a heavy soil may be very materially improved in fertility by this method; but with a light soil it is not so advantageous, especially if heavy rains follow before the newly sown crop has developed sufficiently to utilize a large part of the food accumulated during the period of fallowing.

The second of these methods is that of *green manuring*. This consists in the cultivation of a vigorously growing crop, which is then ploughed under to form a food supply for the following crops. By this means, the material available to a hardy, deep-rooted crop, growing for a long period, as clover, may be made largely available to a crop more delicate in its habits of growth, a surface feeder and growing during the shorter season,—as any of the cereals. The amount of organic matter in the soil is increased, a stiff soil made lighter, and a light soil firmer and less subject to drought.

Both fallowing and green manuring secure fertility at the expense of time. In a limited degree, it is turning the land back to primeval condition to recuperate. Where land is costly, the interest during the time necessary for this recuperation is a seriously large item, and prevents any general reliance upon these methods.

There is another means by which fertility may be increased without the addition to the soil of the materials needed for food, and without the delay entailed by the methods of the first class. In the second class of methods, substances are added to the soil that by their chemical action increase the availability of the nitrogen, potash and possibly the phosphoric acid already there. Such a substance is burnt lime; and others, less active, are ground limestone, chalk, marls and gypsum, or plaster; although the last two, have doubtless, a slight direct food value, especially the gypsum. In general, the effect of the burnt lime is to make the potash more available, and to hasten the breaking up of the humus—partly by increasing the rapidity of the formation of nitrates. The beneficial effect on the mechanical condition of a heavy, wet clay is important in practice, but has no bearing on the amount of plant food present, except as it secures a better circulation of air, and thus hastens weathering. The action of carbonated lime, applied in the form of limestone, chalk and marl is less vigorous, and is more largely confined to hastening the decomposition of the organic matter. Gypsum is believed to aid, as well, in the retention of ammonia in the soil. Its sulphur is sometimes of importance as a plant food in the growth of turnips or clover. Lime is generally present in soils as a carbonate, in both quantity and availability sufficient to supply all demands for its use as a plant food. It is evident in practice that while lime fertilizers are excellent in their effects upon sour, peaty soils, heavy clays, and sometimes on lighter soils,—especially sands lacking in carbonate of lime,—their beneficial effects tend to diminish or disappear entirely where the applications are frequent. In fact, there may be an absolute injury wrought through the wasteful, or too complete decomposition of the humus. Finally, since this class of substances merely increases the availability of the nitrogen, potash, and possibly some of the phosphoric acid already present, it follows that if the latter are deficient in soils, or are present in such combinations as resist the attacks of these indirect fertilizing agents, no appreciable increase of fertility can result from their use.

The only other general method remaining consists in the addition from without the farm of materials that act directly as plant food. These materials may consist of food purchased for cattle, which increases the manure of home production; of stable manure obtainable near large cities, or of the so-called artificial fertilizers, and the waste products of manufacture, which contain the needed fertilizing ingredients in more or less concentrated form, and in a condition of varying solubility and availability.

Space will not permit, and it is not the purpose of this paper to discuss the several variable values of the different materials used for application under this method. It merely remains to indicate that every fertilizing method aims chiefly to make up the balance between the available food material removed or lost from the soil, and that constantly produced through natural agencies; that, in a thickly populated country, following, green manuring and liming, though often valuable, cannot be depended upon to make up the deficiency; that, therefore, it is necessary, sooner or later, to bring to the farm, from without, materials to restore the balance. These materials may be animal foods from other districts, bye-products of manufacture, such as malt sprouts. cotton seed cake, etc., or artificial fertilizers. Since the artificial fertilizers are, therefore, as applied under the systems of farming practiced in Pennsylvania, purely supplementary to the manures of domestic production, they should be selected to supply the ingredients most noticeably lacking in the farm manure. These are generally, as stated earlier, phosphoric acid and nitrogen, rather than potash. Further, unless they are worked into the manure pile or compost heap, they should be applied where they are more beneficial than the yard manure or compost. What ingredients to apply and where to apply it can be more certainly and more cheaply learned by the direct use of the separate ingredients on each farm than by any other known method. In making this statement, the fact must not be overlooked that truths of general application, with reference to the effects of certain particular ingredients upon the development of various crops, have been discovered by experiments conducted on only a few soils.

It is usually more economical to buy higher grade fertilizers, as otherwise the freight on useless material is paid for. It is, further, best to use a fertilizer as immediately available as possible without waste, since a fertilizer is not put into the soil to stay, but to be taken out in the more valuable form of a crop. A long investment is clearly less desirable than one of shorter duration yielding the same return.

HEALTHFUL HOMES.

By GEO. G. GROFF, M. D., *Lewisburg, Pa., member of the State Board of Health and Apiarist of the Board of Agriculture.*

[A lecture delivered at the Warren meeting of the Board of Agriculture.]

The apostle of English sanitation, Mr. Chadwick, has said, "Let me build the houses, and I can determine the ages at which the people shall die." This is probably an extreme statement, for there are many elements outside the house which go to determine the length of our lives; but in our beneficent land, with its salubrious climate, if the house is what it should be, and men and women exercise common sense and judgment in reference to matters of health (which the majority do not do), there is no reason why people should not, almost uniformly, live to be 70, 80, and even 100 years of age; at least, in country places, this should largely be attained.

If our homes and their surroundings were more healthy, *consumption*, *rheumatism*, *typhoid fever*, *measles*, *diphtheria*, *scarlet fever*, *whooping cough*, *malaria* and a host of other diseases, to which we are now subject, would almost disappear. That care will do much to lengthen human life, we make statements from tables of

Vital Statistics.

The death rate in the *Peabody buildings*, London, is $16\frac{7}{10}$ per 1,000 per annum. Immediate vicinity, 30–40 per 1,000. The whole city of London, $23\frac{4}{10}$ per 1,000.

In Great Britain, only 4½ per cent. of all the deaths are *natural*, *i. e.*, not premature.

In the United States, in 1881, in 66 towns, 4,168 persons died of *small-pox*, a preventable disease.

Prof. Chandler, of New York city, says that 15,000 children die in New York and Brooklyn yearly *of preventable diseases.*

In Rhode Island, according to a late report of the Board of Health, 600 natives and 1,200 foreigners died of consumption yearly, but the native population is more than double the foreign.

In a certain town in Pennsylvania, the average age at death among the Friends (Quakers) is 60, while among a large colored population it is only 20, and in many places in our country the death rate among colored people is nearly double that among the whites; in Richmond, Va., it is 21 for the whites, 38 for the blacks.

Cost of Unnecessary Sickness.

In 1876 Dr. Bowditch, of Massachusetts, made a careful estimate of the cost to the people of the United States on account of unnecessary sickness, and he placed the figures at $100,000.000. Later Dr. Kellogg, of Michigan, has made a careful estimate, and places it at $300,000,000. This makes a yearly loss of $6,461,000 to the people of Michigan, and $17,200,000 to those of Pennsylvania, and no account taken of the physical suffering or of the mental pain and anguish from the loss of dear loved prematurely called away.

The Essentials of a Healthful Home.

Pure air, abundant sunlight, dryness, and an exhaustless supply of pure water and cleanliness everywhere are the essentials of a healthful home. None of these are ever to be lost sight of, either in the new home, nor in the ancestral mansion which has for generations passed from father to son. How shall these be attained? The reply is often made at this point, "You are speaking of needless extravagances. These things cost money." It is true. But are not funerals, too, expensive? "The prudent man forseeth the evil and hideth himself, but the foolish passeth on and is punished."

The Site

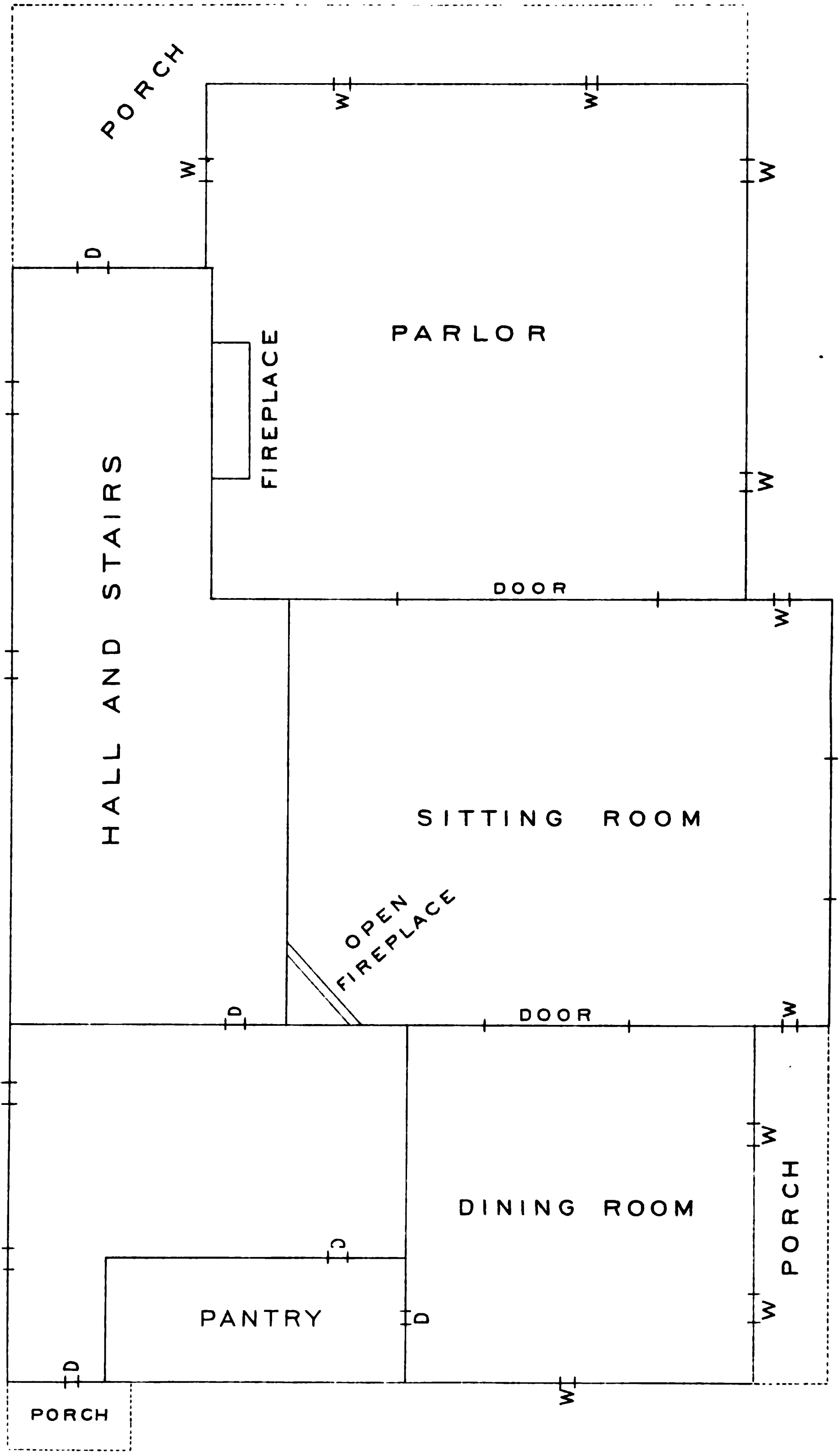
for a house should receive careful attention of the tenant, purchaser, or of one proposing to build. A good site may mean life and happiness, and a bad one *disease*, *suffering* and *death*.

1. It should be dry; avoid, as you would death, a damp location. In a town or city, carefully ascertain whether or not it is on "*made ground*." Avoid it. Avoid ground underlaid with clay for it will always be damp.
2. Elevated on a hillside or gentle knoll, never in a hollow. The hillside is warmer and drier than the hollow.
3. Not close to a swamp, slow river, milldam, or land which is overflowed a portion of the year, nor in such a place that the *prevailing* winds will bring to the house pestilence from a swamp, milldam, etc.
4. In as good neighborhood as possible, away from factories, saloons, etc., and near schools and churches.
5. In a village or town, build on as large lot as possible, thus securing air and sunlight. Build back from the street, thus avoiding the dust of the dry season and the curious gaze of every passer-by. Secure a yard in which trees and plants will furnish both exercise and health.
6. In the country build back from the highway, giving an abundance of room for trees and shrubbery about the house. Do not select a place where your family will be isolated from all social intercourse, so necessary to health of mind and body.

The Aspect.

Let the house be so placed that it will receive the most *sunlight* and *fresh air*, especially from the summer winds. Avoid, even if offered rent free, a *damp*, *dark* house, with no chance for the free air of heaven to sweep through it.

If the house is only one room deep, it does well to face it to the S. or S. W.; but if it is two rooms deep, those on the north side never receive any sunlight, and are apt to be damp. For a double house it is best to face it to the east. Then the morning sun will warm up the front and the afternoon's sun the rear of the house, and thus all the rooms will be bathed in light and warmth. *The living rooms should always be warmed by the morning sun.* This hint is worth a great deal as a health matter. For when the sun cannot enter the doctor must enter. If the cold winds from the north and west are severe in the winter, they may be broken by a cluster of evergreen trees planted on those sides. In country places a good aspect should be secured,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without reference to facing the house square with the street. The writer has recently erected a house of fourteen rooms, all of which face either the south or west, except two hall rooms and the bathroom. The engraving shows how this is accomplished. The diagram gives the first floor. The second and third floors follow the same general plan. No attempt is made to give correct proportions nor details. The living rooms are all on the south, while hall and kitchen effectually protect a living rooms from cold winds.

The Design.

In building a new house, or in the selection of an old one, let the design be as *simple as possible.* The house should be *durable*, *convenient*, *well lighted*, *well ventilated* and as *large as the means* of the occupant will warrant. Great attention should be paid so convenient arrangement of the kitchen, wash-house, well, cistern, wood-shed, etc. Every possible useless step should be saved those who do the never finished housework. Especially is it important to save all possible running up and down stairs. Have all possible on the same level. A mean house must always tend to degrade its occupants, while a good one tends to elevate them. Where there are children, this is of much importance. We read of great men born in log cabins, but they did not stay there long. A laboring man *content* to remain with his family in a hovel is generally a hopeless and irreclaimable man. Persons well to-do are often careless and thoughtless in this matter. A *respectable*, well-kept house is a *great educator* of the young.

The Foundation.

In building a new house the foundations should be laid with great care to produce dryness of the walls. In a damp soil a drain of tiles should be laid entirely around the foundation walls, with free openings for discharge. The walls should be laid in Roman cement or in asphaltum so that no moisture will be transmitted. They should be double, with an air space between them, that no moisture from the earth adjacent the outer wall be transmitted to the cellar, and as a final precaution a little distance below the first joist a water-proof layer of slates should be embedded in cement or asphaltum, to prevent the rise of moisture into the walls above. Ordinarily a good deal of water may be kept out by packing clay against the walls on the outside to the very bottom of the foundation.

Avoid a house with damp, musty, mouldy foundation walls.

The Walls.

These may be of *wood*, *brick or stone*, whichever is most convenient, all are good, if properly used. Let all walls be made double, with an air-space between them. This will make the house much warmer than otherwise. All brick and stone walls should be lathed and plastered *on the inside* to keep out cold and dampness. This precaution will cost only a small part of the inevitable doctor's bills, if omitted. Wooden walls should be painted on the outside for protection and effect. Brick walls are also much warmer and drier if painted, but they are not so pervious to air as when unpainted. An ordinary brick can readily absorb one pound of water in a dashing rain storm, and much of this will pass into the house. Stone walls should be "dashed" or well "pointed" to keep out rain and dampness.

The Cellar.

This is generally the greatest source of danger about our homes. A damp and dirty cellar means generally plenty of *rheumatism*, *pneumonia*, *pleurisy*, *colds*, *consumption*, and diseases of children in a virulent form. So dangerous is the cellar considered to be that some sanitarians, as Dr. Richardson, of London, advocate their entire abolition, and that an *airtight* and watertight pavement be placed between the house and the earth. An excellent plan is to have the cellar half above ground, thus ensuring light and air in abundance. Every farmer should have a cellar under barn or wagonhouse in which to store roots and vegetables.

The man who cares for his family should see that the cellar floor if damp is laid in Roman or asphaltum cement, so as to entirely exclude water from below. It should be dry, well ventilated, open to sunlight, clean, well whitewashed several times a year. Remember that *foul air in the cellar is sure to find its way all over the house.*

Many families who wonder why it is that one of the children is always sick, could discover the reason by going into cellar. Dr. R. C. Kedzie, of the Michigan Agricultural College, thus speaks:

"Go down into the cellar and examine the foundations of life; see whether the cellar is dry and well ventilated, and the air sweet and wholesome; that no vegetables and useless rubbish of any kind are left to rot in your cellar. Or do you find all kinds of things going to decay, the cellar wet, the walls slimy, mould spreading over everything, and a close, stifling odor pervading the air of your cellar? If these inanimate things could give voice to their warning, what a sound would startle our ears in hundreds of cellars in our State! 'Here lie in ambush diphtheria and membranous croup, the destroyers of childhood, and typhoid fever, that strikes at all ages; here lurk the seeds of consumption to bring forth the slow but sure harvest of lamentation and woe!' 'For the stone shall cry out of the wall, and the beam out of the timber shall answer it.' But though these voiceless things speak no word of warning, they hang out the flag of danger; the spotted mould and fungus attacking the timbers of your cellar show that destructive agencies are at work. Why, man! death is gnawing the very sills of your house, and shall he spare these tender morsels, your children? These damp, musty, mouldy cellars are the seed beds of disease. Do not hope to preserve health over such a charnel house. Do not leave vegetables to rot in your cellar to spread rottenness through all your house. The wet cellar foretells wet eyes up-stairs! Drain it, and underdrain the surrounding soil so that your cellar shall always be dry. Drive out all mustiness and mould by ventilation and by *abundant* use of whitewash. Make the air of your cellars at all times sweet and wholesome, because much of this air will find its way into the rooms above. But if you neglect all of these things and the Angel of Death spreads his dark wings over your household, do not charge the effects of your nastiness and laziness to a very myterious Providence! 'A prudent man foreseeth the evil and hideth himself, but the foolish pass on and are punished.' The cellar should be as *dry*, as *clean*, as *sweet* as any room up stairs. It should be whitewashed not once a year, but, if at all musty, once a month. Open all its windows, and ventilate completely."

Dark Corners.

Pantries and passages should receive the same careful attention as the cellar. Mould, dampness and foul smells are never to be neglected. Ventilate every part of the house thoroughly, and if possible almost daily. You cannot afford to keep the spare room and the parlor shut up until they become musty. Sunlight and fresh air are the best disinfectants known, and the cheapest; where they cannot enter, the doctor will. Especially should the bed rooms and the beds be thoroughly exposed to the sunlight and air. Bed clothing should be hung over the chairs for an airing at least an hour every morning. Ventilate, ventilate, ventilate. It is much better to have faded carpets and faded walls than faded children. We have been taught to fight dirt, disease and the devil; but rather fight dirt, dampness, darkness and disease, and the devil will fly far away. The healthful home has no closet in which are stored a varied collection of *patent medicines*. The inmates of a healtful home do not believe that health may be thrown away with impunity and then repurchased at any drug store. The drug superstition is one of the most firmly fixed of all superstitions among educated and cultured people. Disease is conquered not by drugs but by correct living. Man was not made to feed upon the wares of the chemist. The man who docters himself with patent medicines has a fool for a patient.

The Living Rooms.

First. They should *all be fully above ground.* No half-above-ground rooms are usually dry enough for human habitations.

Second. They should be on the sunny side of the house, and warmed by the morning sun, if possible. Avoid the cold, damp rooms of the north side of the house. In the town where the writer lives there seems a strange tendency to live on the north side of the house. In whole streets this is the nearly universal custom. Where a row of closely built houses extends north and south, the back buildings of each alternate house will be much better exposed to the sun than the others, so that the value of these houses is greatly increased.

Third. They should be as full of windows as possible, and these unobstructed by curtains and plants. Light is life.

Fourth. The living rooms should be the largest and pleasantest in the house. The ceilings of moderate height; eight or nine feet is abundant space overhead. The higher the ceiling, the harder it is to keep the room warm.

Fifth. The floor timbers should be well ventilated, and no bad gases should be arising from the cellar

Sixth. The walls painted outside (where exposed to rain), and studded, lathed and plastered inside.

Seventh. Whitewashed walls are healthier than those papered, and oiled and varnished floors than those covered with dirty carpets. *In no case is a stone or brick floor suitable for a living room.*

Eighth. Living rooms should all be on the same level in order to save unnecessary steps. Continual climbing is tiresome and unhealthful.

Ninth. The most healthful covering for kitchen walls would be of *glazed tiles*, which could be washed and scrubbed in a thorough manner.

Bed Chambers.

These should be large, airy, light and pleasant as possible. Don't set aside the best room for guests. The bed chambers should not be on the first floor, on account of dampness. They should be a full story high. This costs but little more, and gives much more air space. They should be flooded with sunlight every day, and with fresh air night and day for those in good health. They should not be encumbered with unnecessary curtains, carpets, etc., etc. They should be kept perfectly clean. The beds, pillows, blankets, etc., should often be exposed all day to the sun. In our climate it is well to keep a blanket on the bed the whole year round.

A Sick Room or Nursery.

Where it is possible, one bed room should be set aside for the sick. It should be the lightest, airiest, most cheerful room in the house, with a southern exposure. It should be a room isolated as much as possible from other rooms; best in the third story. It should have an open fireplace. The furniture should be sparing, but the room not bare. In such a room, it is entirely possible to prevent the spread of measles, diphtheria. scarlet fever, etc., even in a large family of children.

Ventilation.

In ordinary houses a great deal of fresh air enters through the chinks and crevices, but not enough. Living rooms should daily be thrown open, doors and windows, that all the stale air be swept out. The very best plan known for ventilating a home is to have *open fire-places* in the rooms with a little fire in them. If possible, *have them in all living rooms and bed chambers.* Foul air is the great cause of diseases of the respiratory organs. The sense of the smell is a good guide to the purity of the air in a house. It will occasionally be observed that a house has a peculiar odor, known as "house odor." It will generally be found that the inmates of such houses are in a state of chronic sickness. Possibly they are not very sick, but they are never entirely well. The rule is, such homes need more fresh air. They are foul and musty for want of it.

"In modern hygiene, nothing is more conclusively established, than the fact that vitiated atmospheres are the most fruitful of all sources of disease."—*Playfair.*

"Headache, nausea, and lassitude, great debility, impaired digestion, severe colds, consumption and other diseases of the respiratory system, as well as other serious diseases, may be caused by confinement in the foul atmosphere of an unventilated room."—*Dr. Frank Wells.*

"Though foul air is a slow poison, we must not forget that a blast of cold air may slay like a sword."—*Dr. Angus Smith.*

Windows should not be lowered in cold weather when a draught of cold air may fall upon the head. Much fresh air may be introduced into a room by placing boards * about six inches wide under the lower sash of each window in the room. A space will be formed between the two sashes through which a stream of air will enter the room.

In connection with ventilation a suggestion might be made as to the use of the housetop. In eastern countries it has for centuries been the custom to use the roof or housetop as a sleeping place in warm weather. It has seemed to the speaker, that in our cities and villages, the same might be done in America. On the housetop the air would be coolest and purest, and nights of repose might be obtained where now is only restless tossings and discomfort.

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* In place of the boards, screens covered with flannel have been successfully used.

Warming.

The healthful house is well warmed, not overheated, not cold. Where it can be afforded, it pays to warm the whole house, though bed chambers need only have the chill taken from them. The chimney should *never be in the end of the house*, but pass up through the center. In this way, a great part of the heat ordinarily lost may be given out into the house. A stovepipe which enters the chimney a few feet from the stove or furnace probably carries off *one-half* the heat which the fuel produces. An excellent plan in small houses is to carry the stovepipe through the rooms above, and to let it enter the chimney only at the top of the house. Remember that the aged and the very young cannot stand changes of temperature as adults do, so when cold snaps occur, extra efforts should be made to warm the house. Where a hot-air furnace is used, if the cellar is kept as it should be, there is no objection to drawing the supply of air for the furnace directly from the cellar. The air in the cellar will find its way up stairs in any event. Likewise, there is no great loss in warming the cellar, for the air in the cellar warms the living rooms, and thence, the whole house. In warming with stoves, hot-air furnaces and indirect radiation from steam, ventilation in a good degree is carried on at the same time, but in-direct radiation from steam pipes, there is no attempt in the system towards ventilation. Where there are little children in a house, it should not be forgotten that the coldest air in a room is on the floor.

The Water Supply.

Running streams and *springs* are the best sources of water supply, but they should be frequently examined to detect otherwise unsuspected causes of pollution; these most frequently coming from factories, slaughter houses and the sewage from hotels and farm houses. Especially should a town see to it that all forms of human excreta are kept from polluting its drinking water.

Cisterns should be carefully built and covered so that no foul air can reach the water, or small animals or insects fall into them. The overflow pipes from cisterns should have no connection with any other pipes. Roofs and gutters should be frequently examined, and no water allowed to enter the cistern until they are well cleaned. Cistern water should be frequently examined and kept free from color, odor and every other indication of impurity.

Wells are the most dangerous source of water supply, for very few wells in old settled districts are safe from surface pollution. In towns long founded, well water is almost certainly contaminated and unfit for human use. In the country, wells should be properly located so as not to receive surface drainage, especially not from the barnyard or privy. They should be walled up and so securely covered that mice, rats, toads, frogs and insects cannot enter and perish in the water, thus making it unfit for use. It has been the writer's experience that few wells are securely enough protected from small animals, while very many are contaminated from the barnyard, the privy or by the refuse from the kitchen. It should be kept in mind that *very impure water is often bright, sparkling and tasteless.*

A simple method to test waters for impurities is to dissolve a lump of loaf sugar in a clean bottle filled with the suspected water; close the bottle with a close fitting glass stopper, and set it in the window where the sunlight will fall upon it. If the water remains bright and limpid after a week's exposure, it may be pronounced fit for use. But if it becomes turbid during the week, it contains enough impurity to be unhealthy. Whenever it is necessary to use for drinking purposes a water suspected to be impure, it should always first be boiled thoroughly; and since boiled water is insipid to the taste, it may be flavored with tea or some other harmless substance. In *all cases, boil the suspected waters before using them.* In summer and autumn when waters are low they are generally most impure. When filters are used, it should be remembered that in time the filter itself will need cleaning. Such a contrivance as a self-cleaning filter is unknown.

Impure water affects domestic animals as well as man, and when used by cows contaminates seriously the milk. "Wet weather" ponds are not a fit source of water for milch cows. Milk also has great power to absorb deleterious gases and germs from the air and thus becomes a common carrier of disease. A careful man will pay as much attention to the source and quality of the milk used by his household as to the water supply.

Plumbing.

Have as little to do with the plumber's art in your house as possible. Let *all pipes be exposed*, never hidden away in the walls or under the floors, especially under the cellar floor. Never permit a drain, if possible, to lie under the cellar floor. Have as few stationary wash stands as possible. Some of the best houses in the country have rejected them entirely. Don't place too much dependence in traps; use them, but try and make all things so clean there will be no need for them. Traps, disinfectants and filters are too often only delusions and snares to the unwary. Be on a continual guard here.

Water Closets and Privies

should receive close and repeated attention. *Foul odors are nature's signals of danger.* For farms and villages the only known *safe*, the only *scientific*, the only *economical* method known of disposing of human excreta is by the use of the *dry earth system.* By this plan we absolutely avoid all danger of contaminating the water supply; we avoid all bad and disgusting odors, the expense of digging a pit, and the cleansing of the same, besides securing an inoffensive and most valuable fertilizer for the garden and farm. To put into operation this system, all that is needed are galvanized buckets to receive the excreta, and a liberal supply of dry earth to cover the same. Sifted coal ashes answers very well, though it does not absorb moisture as well as earth. The speaker finds that fine garden soil is the best earth for this purpose. The contents of the buckets may be deposited in the barn-yard or directly on the garden.

The old-fashioned privy vault should be absolutely abolished in all farm and village communities. It is one of the worst possible relics of barbarism. It is the most dangerous and deadly thing about our homes. There is death in the solid and liquid contents, which are all the while percolating through the soil and finding their way into the wells and water courses, so that if the present generation is not poisoned in this way, future generations surely will be; and there is death in the nasty putrid exhalations from the same result, which enters the lungs and poisons us at every breath. *Abolish the thing from every home.* Where old privies exist and are very offensive, they may be best deodorized by throwing in two or three feet of fresh earth, completely covering the contents, when all odors will be absorbed. The privy should never be under the same roof with the house, and yet it should be reached without undue exposure in inclement weather. One should always be able to reach it dry-shod. It should be so protected that cold blasts do not blow under it and upon the exposed person. This last is an important health consideration. A privy should never be placed on a higher level than a well or cistern, and not nearer than 200 feet. While human excreta is most deadly, we have no positive knowledge that the same is true of the excreta of our domestic animals.

For farms, a very convenient mode of emptying the earth closet consists of a box on a wooden sled, to be slipped under the privy. The box should be lined with zinc and will last a life-time. By placing the privy so that it opens in the rear into a field, it is attended to with the greatest ease. A chain should be permanently attached in front to which to fasten a horse.

A closet adapted to the dry-earth system, pail plan, is applicable to farm privies; a door at the rear permits the removal of the pail; the pails should sit up close to the hole, and one oval in shape, like a coal scuttle, is best. I have one whole end of my privy partitioned off to a depth of one foot to hold the dry earth. This chamber will hold about a cart load. It has a door near the top, on the outside, to receive the earth, and a small opening near the bottom on inside from which the earth is taken to throw into the pails. The system works perfectly, and the fertilizer produced, entirely without odor, is worth many dollars yearly. This pail system can certainly be introduced in every village in the land at a great profit.

Water-closets are not recommended for country places, but when people insist on using them they should be carefully constructed, *kept at all times absolutely free from odor*, and always plentifully supplied with water. The water pipes should never be hidden in the walls, under the floors, or under the cellar, but exposed to view and accessible, entirely disconnected from all other pipes, provided with the best traps, with means for ventilation, and so arranged that no odors from the same may enter the house. The water-closet is best built against the kitchen chimney with a ventilating flue into the same. This will give the best possible ventilation to the closet. The householder must look after this closet himself and *place no trust whatever in any automatic hygienic contrivance.*

Garbage and Slops

from the kitchen, when thrown around the yard in a slovenly manner, decompose, and emit gases poisonous to man, and form at the same time breeding beds for poisonous germs. In rainy seasons a portion of this filth often finds its way into the well or cistern. Kitchen slops and garbage are doubtless often the cause of malaria, diarrhœas, dysentery and more serious troubles in country and village homes. In towns the garbage should be removed daily if possible, and in all cases before it has time to decompose. The pipes which carry off the slops from the kitchen should be securely trapped that no foul gases enter the house through them. In country places, villages, etc., the slops from the kitchen should be carried at least one hundred feet from the house and the well, in glazed pipes, securely cemented at the joints, and can then be used to fertilize the garden plot or the fruit trees. The solid garbage, as parings, etc., may be thrown into a pit in the garden and kept covered with earth until decomposed, when it may be applied to the soil.

Better than a drain to carry off kitchen slops is a barrel mounted on wheels. This barrel may receive the slops until full, and then be emptied upon the garden or about fruit trees. All kinds of fresh parings are healthy food for the family cow, and most of the scraps from the table may be fed with profit to chickens. In this way we gather up all the fragments. Nothing is wasted and nothing lies about to decay and poison the family.

Danger from Contagious Diseases.

A large portion of our people are renters of houses, and frequently change their abodes; but how many are careful or thoughtful enough to ask about diseases which have recently been in the house to which they propose to move their families. The point is this: The germs of many diseases, as scarlet fever, measles, diphtheria, typhoid fever, etc., may linger for months about a house, and a family moving into such a place may in a few weeks be stricken down, much suffering, expense, and even death be the result. There is no truth in the old idea that children must have the whole series of children's diseases. The most of them can be avoided, and if more care were exercised by parents, thousands of innocent lives might be saved. If children can be carried beyond the age of sixteen years without contracting scarlet fever or diphtheria, the two most dreaded diseases of childhood, there is then comparatively little danger from them. The same is true of other diseases. The heads of families cannot, therefore, be too careful to inquire into the

Reputation of a House.

Some houses are notoriously unhealthy. Many are built on made soil, and permeated with foul gases. Many have had contagious diseases in them recently; many houses have damp or wet cellars. All these are to be avoided as pest-houses. In a great many the water supply has long been contaminated, and one cannot drink from them in safety. About others the soil is saturated with all manner of foulness, and poisonous gases arise in consequence to permeate the house. Some houses are in bad neighborhoods, some near mill-dams or swampy, malarious grounds. The writer knows of a number of houses with so bad a reputation that he would not accept them as homes under any circumstances. Funerals are yearly occurrences in them. To all these matters the careful man should give attention. It may be of some interest to him that in some of the States the courts have decided that the owners are responsible for all losses to a tenant, from sickness in cases of a house notoriously unhealthy or in which recently there has been a contagious disease, whenever the landlord covers up the facts in the case.

Disinfection and Disinfectants.

The popular belief seems to be that to disinfect is to cover up one bad odor with one more powerful. On the contrary, sanitarians aim to *absolutely destroy all noxious vapors* about our homes, or better still, to prevent their formation.

Fresh air flooding every portion of the house, sunlight in every room, a judicious use of soap and water, and plenty of whitewash in all places where it can be applied, leave the use of drug disinfectants at a minimum.

There may be times, however, at which anyone may need some reliable drug, and for this reason, those now considered most efficient are named. (They should always be purchased of a reliable dealer and should always be of the best quality.)

For the Disinfection of Water-closets, Urinals, Sinks and Cess-pools.

Carbolic Acid Solution.—Mix one pint of carbolic acid with two and a half gallons of water, for drains, sinks, etc. Dry chloride of lime may be sprinkled over the contents of a privy. In country places, after the use of the above disinfectants, throw into the privy two or three feet of fresh earth, which will entirely destroy all foul emanations.

To Disinfect the Sick Chamber.

The room must be vacated. The paper should all be carefully scraped from the walls. Thorough ventilation for several days, and thorough washing of all surfaces with one of the disinfecting solutions, say, a quarter of a pint of solution of hypochlorite of soda to a gallon of water. The walls and ceiling, if plastered, should be washed with this, and then whitewashed. All dust must be carefully washed (not brushed or swept) away from ledges, cracks, corners and crevices.

The Wash-House.

Attached to every well regulated home should be a wash-house. It is often dangerous to send clothing from home to be washed on account of contagious diseases, and washing cannot easily be done in the house without making it damp and unpleasant. As a health measure, wash-houses should be built.

Trees.

In country places trees add much to the value of a house, but care must be taken that there be not too much shade produced *immediately* around the house. They may be near the house, not over it. Better have the sunshine over the whole house and to enter every room. An abundance of trees produces moistness and dampness of the air. One tree shading a house is enough. It has a number of times been observed that a home is healthy while in the sun, but when trees have grown about it, it becomes unhealthy. Trees may be used in the country with great advantage as wind breaks.

A Garden.

The heathful home has a garden from which the inmates derive fresh vegetables and in which they secure physical exercise *in the sun*, so beneficial to health. The garden gives a variety of food, needed by all hard workers of brain and muscles. The speaker has seen farmers near large cities purchasing their vegetables of hucksters who brought into the country the stale refuse of the city markets

He could never bring himself to believe that this was the proper or heathful thing to do.

Foods.

The time here will not permit but bare mention of foods. Let attention be called to the importance of *more variety* and *better preparation.* The speaker most fully believes that "bad food, unwholesome surroundings, unclean habits and foul air are the best friends of alcohol," and that he indiscriminate and excessive use of alcohol is the greatest curse of our modern life. A man recently said to the speaker: "If I have plenty of potatoes, pork and cabbage, what more do I need?" He needed *variety* which he finds in the excessive use of alcohol.

A great work is to be performed by some one who will insist on better preparation of food. Often, it is true, women have small opportunities to do their work well, but in very many cases it is certainly true they have no idea whatever of what healthful appetizing food is. Especially is this true in the homes of our laboring people.

The Country Home.

There is yet a point to which we would call attention. Every city or town dweller should aim, so soon as practical, to secure a country home. Where good facilities for railroad travel exist, this can be done at once in a great many cases. The lowness of first cost, of rents, of car fare, the purity of the air, of the water, the freshness and beauty of the fruits and vegetables, make a home in the country worth more to a city man than almost anything else he can acquire in this world. To most persons, the country home would add much of comfort, and probable additional years to life. Secure the country acre at once, and give to weary wife and faded children that health and strength which is theirs by right. A town may be a proper place for an adult to live in, but the country is the proper place for children to be born in and reared. The country furnishes a majority of our successful professional and business men. The great men of America have nearly all been country boys. Then give the boys a chance.

A Final Consideration.

One may plan with the greatest care, he may secure all the appliances most approved, he may spend his money without stint to the end that his home may be healthful, but there still one thing needed, without which all will be in vain. This needed factor is *the eternal vigilance of the good housewife; through her earnest and hearty coöperation only will the truly healthful home be secured.* It is the province of the husband to provide of all things an abundance, but the wife dispenses. Hers it is to keep up the constant fight with dirt and dampness, the prime factors in producing most disease and suffering under which the human family labors. Let every considerate man lessen her arduous labors all in his power, and thus do his part in securing a truly HEALTHFUL HOME.

CENTRIFUGAL SEPARATORS.

By the SECRETARY.

It had long been a well known and recognized philosophical fact that rapid centrifugal motion had the power of greatly increasing the differences in the specific gravities of liquids, but previous to 1859 it does not appear that any attempts had been made to utilize this fact and adapt it to practical results in the separation of cream and milk. Experiments have proven that this increase is very great at high speeds and that it is in about the following proportion :

120 revolutions per minute—increase in specific gravity, .	2½ times.
600 revolutions per minute—increase in specific gravity, .	61½ times.
1,000 revolutions per minute—increase in specific gravity,	170 times.
2,000 revolutions per minute—increase in specific gravity,	684 times.
3,000 revolutions per minute—increase in specific gravity,	1,537 times.

It then follows that the slight difference in specific gravity, between milk and cream, so slight as to render their separation difficult under ordinary circumstances, becomes so increased under a speed of 3,000 to 5,000 revolutions per minute, that their separation is rapid and almost instantaneous, and it is to this principle that centrifugal creamers owe their success.

Professor N. J. Fjord, of the Royal Agricultural College of Copenhagen, Denmark, thus sums up this problem (see page 6, of "Creaming by Centrifugal Force, by Frederiksen):

"In other words, for 1,000 revolutions a minute, the distance from the center being one foot, the centrifugal force is 340 times the weight of the matter; the distance being two feet, it is 680 times; the distance being three feet, it is 1,020 times the weight. Suppose the weight of the particles of fat in the milk to be ten weight units, and then an equally large particle of milk serum be eleven weight units. then the force by which the fat is naturally driven towards the surface will be eleven less ten which is one ; while in the centrifugal machine making 1,000 revolutions per minute, with an average radius of one foot, the force will be the difference between 340 multiplied by 11 and 340 multiplied by 10, which is 340. Suppose a stick to make a thousand revolutions in a minute around its center in the horizontal plane, at each end carrying a pail of milk weighing sixty pounds, and supposing the average radius to be two feet, then the force with which each pail will pull the stick, is 340 multiplied by 2, multiplied by 60 or equal to 40800 pounds or 20 tons."

Bearing in mind the fact that this difference in specific gravity is governed by the distance of the liquid from the center of motion and the speed at which it revolves, and that its increase is very great and rapid when high rates of revolutions are reached, the reader will

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NOTE.—Realizing the impropriety of introducing into a State report anything which may be construed to be an advertisement of an implement, we have in the preparation of the following article, endeavored to exclude as far as possible anything savoring of "shop." In our description it was absolutely necessary to give the names by which each Separator is known to those familiar with the work of the dairy, but care has been taken to mention no firm or party offering them for sale. In the preparation of the article the secretary would acknowledge his indebtedness to the work of J. D. Frederiksen, entitled "Creaming Milk by Centrifugal Force," and would advise any one wishing to examine the principle and its application further, to obtain the work.

readily understand the single principle upon which centrifugal creamers are based, and will readily be able to follow, step by step, the inventions which have culminated in the machine as we know it.

Although previous to 1859, the centrifugal force had been practically utilized in the separation of molasses from sugar, of the coarser parts of brewers' grains from the beer, and in laundries as a substitute for hand wringing, yet no attempt appears to have been made to utilize the power described above, in the separation of liquids of different specific gravities. In ordinary mixtures of oily matters and water the separation required no such power for the difference in specific gravity was so great as to lead to a rapid and natural separation by the lighter raising to the surface; but with milk and cream this difference of specific gravity was so slight that it required a certain temperature to effect the separation in twenty-four hours, and under unfavorable circumstances, a natural separation would not take place at all, the globules of fat becoming entangled in the particles of casein and sour milk and not reaching the surface at all.

In addition to the problem of the separation of the cream and milk, a much more serious one met the early inventors, who sought to apply the principle to dairy practice as after the two were separated by centrifugal action, it was necessary, before a complete machine could be reached, to be able to remove both in a continuous stream and at the same time provide for a regular supply of new milk. The difficulty to be overcome was to so construct the separator as to remove the cream and skim milk by different apertures and at the same time, so arrange their removal that the relative amounts of each could be regulated at will. As in all inventions, such matters seem easy after they have been perfected, and so it was with the centrifugal separators of early date. But for several years the talent of inventors was directed to the production of a machine which should merely divide the cream and milk and leave their separation into two masses, to the usual modes followed in dairy practice.

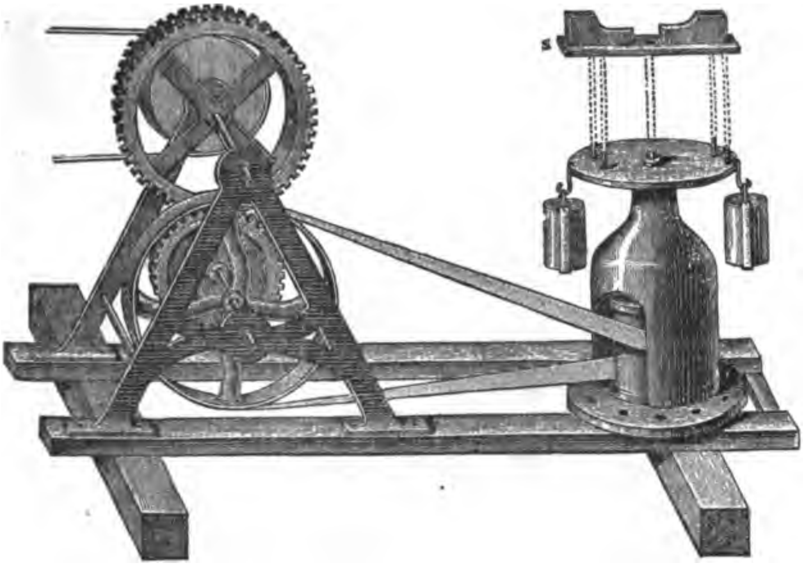
Early in 1859, Fuchs, of Carlsruh, in Germany, constructed a rude apparatus in connection with a centrifugal used for the separation of solids and liquids, and by the use of tubes attached to the central spindle succeeded in effecting the separation in a very short time as compared with the ordinary dairy methods. His experiment failed to produce any practical result, from the fact that he did not understand the absolute necessity for greatly increased centrifugal motion. Content with the results reached with not more than two hundred revolutions per minute, he failed in his experiment.

In 1864, Prandt, a Munich brewer, attached bottles of milk to a centrifugal in his brewery and carried his experiments so far as not only to separate the cream and milk, but also to convert former into butter; his experiments, like those of Fuchs, failed in practical results.

In an address before the American Dairy Association, in 1880, E. Burnett, stated that in 1870 Rev. H. F. Bond, of Northboro', Mass., succeeded in effecting the separation in one hour, by the use of a crude hand machine of his own construction, with a revolution at about the same rate as that attained by Fuchs.

In 1873, Jansen, of Denmark, constructed a centrifugal machine by which two pails of milk might be suspended at each end of a horizontal revolving rod, and at a speed of about 400 revolutions per minute, succeeded in effecting a separation, but from some defects in construction, his experiments were not fully perfected.

At the Vienna dairy fair, of 1872, Prof. Moser exhibited a centrifugal machine for this purpose and it attracted the notice of the celebrated manufacturerers of dairy implements, Lefeldt & Lentsch, of Schoeningen, who took the matter up, and in 1874, Mr. Lefeldt exhibited at the international fair, at Bremen, his first centrifuge, of which we give a representation.

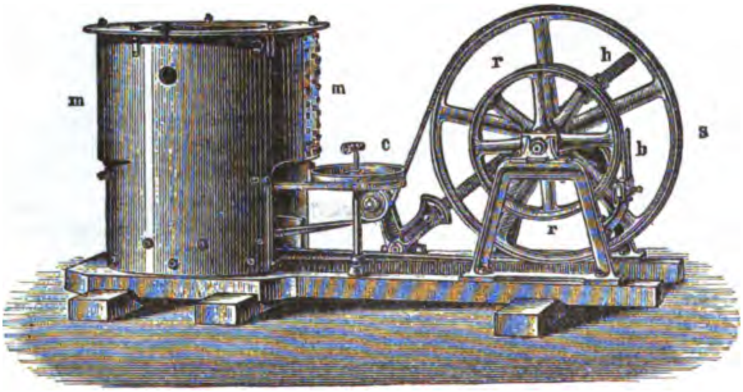


Lefeldt's First Centrifuge.

As is shown by the engraving, Lefeldt's first machine consisted of cumbersome machinery by which the rate of speed was increased, and a horizontally revolving disk to which pails of milk were attached By a series of disks, one above another, it was proposed to increase the capacity of the machine. The pails used were constructed for the purpose, and were well braced by a series of iron rods and stays. With this machine running at the rate of 650 revolutions per minute, Lefeldt could readily separate the cream in twenty minutes, the pails were then removed and the cream skimmed off in the ordinary way.

When compared with the separators of the present day, the defects of this machine are apparent; the power required to whirl the heavy pails around through the open air was great and this absorption of power so increased the expense that all profit was lost, and nothing but convenience was left to recommend its adoption. But this machine appears to have been the starting point in the centrifugal separation of cream and milk, and it contained certain principles which are still in existence in the best machines.

In 1874, at a Danish dairy fair, the possibility of substituting a revolving drum for the pail arrangement of Lefeldt was talked of, and attempts were made by many inventors to accomplish the substitution. In 1876, Winstrup substituted a drum for the horizontal table, and, modeling his machine after the centrifugal used in the breweries and sugar manufactories, he constructed a machine with a solid drum (not pierced with holes as were the hydro-extractors of the sugar refineries) in which, by rapid revolution, the cream and milk were separated. As soon as the separation in the drum was supposed to be complete, valves in the outer periphery were opened, the motion decreased and the skim milk thrown out; before the perpendicular column of cream reached the surface of the drum, these valves were closed, the machine stopped and the cream (mixed with a small portion of skim milk) removed. This machine, with one constructed about the same time by Lefeldt, marks another step in the invention of the separator, viz: that of the separation of the cream and milk by the machine itself. But even this was very far from the continuous separator of to day.



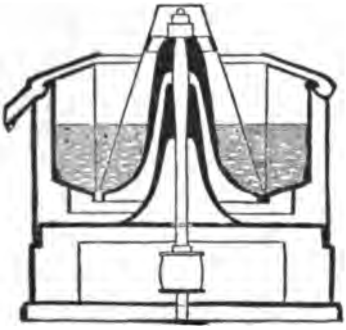
Lefeldt's First Drum Centrifuge.

In 1877, Lefeldt exhibited his drum centrifuge and with a speed of 850 revolutions, effected the desired separation in twenty minutes. From the fact that suitable drums could not be procured, Lefeldt found it necessary to surround his machine with a strong, cumbersome iron casing, which gave it an ungainly appearance, which was afterwards gotten rid of by lighter castings and better drums.

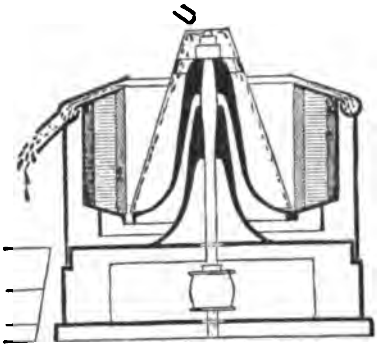
When the operation was complete the machine was stopped and after the lapse of a few minutes the cream rose to the top and the skim milk was drawn off by a siphon and the cream removed from the drum which was then ready for refilling.

In a series of experiments with the Lefeldt centrifuge by Dr. Fleichmann, it was found that after it had reached its maximum speed of 850 revolutions per minute, it required about twenty minutes to effect a perfect separation and that in ten minutes more the machine might come to a stand still. It was noted that soon after a speed of sixty revolutions was reached, the milk all left the bottom at the center and, as the speed gradually increased, rose in a perpendicular wall around the sides of the drum leaving the center clear; in a short time, at the maximum speed, the cream gathered in the form of a perpendicular wall inside the milk and nearer the center of the drum.

The next step towards the perfect separator was to construct a machine which should remove the cream while in motion, and in 1877, Lefeldt exhibited his "self skimming" centrifuge.



Lefeldt's Self-Skimming Machine before being started.



Lefeldt's Self-Skimming Machine in Motion.

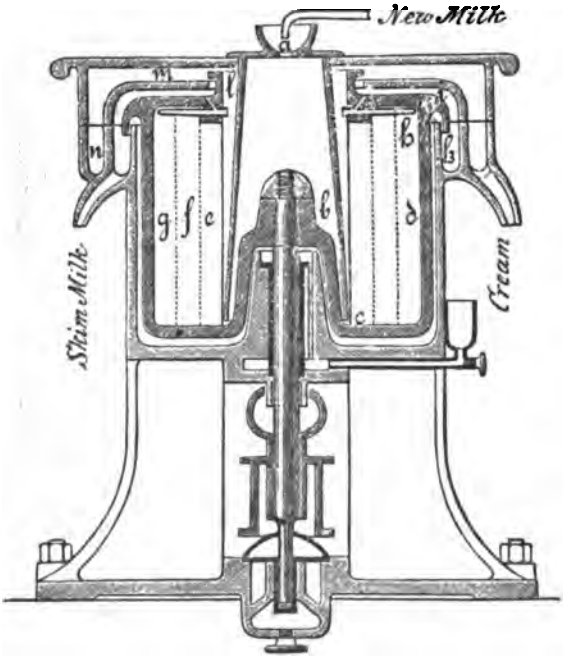
The main difficulty with the previous machine by the same inventor was that the cream, when the centrifuge was stopped, had a tendency to mingle with the milk again, so that the separation (final) was never quite perfect. To remedy this, Lefeldt constructed the cover of his drum so that it should present to the top of the column of cream a narrow flange which, when reached by the cream, would turn it into a hollow in the cover and thus carry it to the outer rim of the cover where it was discharged. In operating the machine, the new milk was turned in in the usual way, but as soon as the cream began to escape over the edge of the cover the supply of new milk was stopped and skim milk run in instead; this skim milk, raising around the outer rim of the drum, forced the cream inward and upward and into the opening at the top; as soon as skim milk was raised into the cover the supply was stopped, the skim milk taken out of the drum, and the operation repeated. From the time that it was first turned on, until the cream began to flow from the cover, the supply of new milk was continuous, and it only ceased when it became necessary to introduce skim milk to force out the cream.

So near did this machine reach perfection that in a series of experiments by Dr. Kirchner, it was found that 94 per cent. of the cream could be taken out.

Following up the inventions of Lefeldt (though not in exact chronological order) we next find him at work on a machine which should remove both the cream and skim milk while in motion, or, in other words, what is now known as a "continuous creamer."

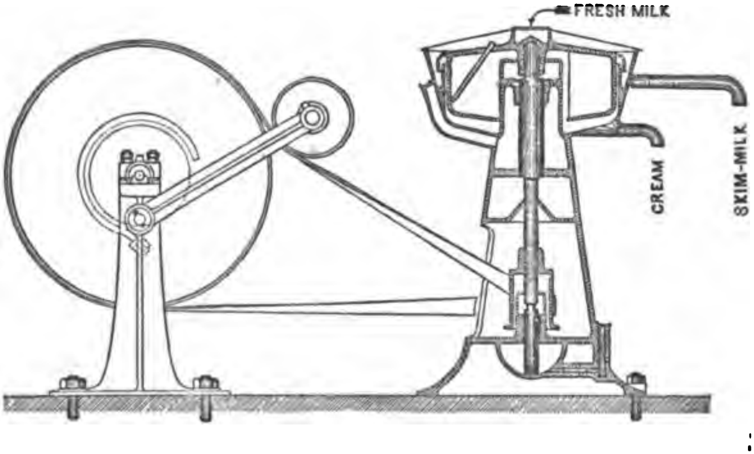
In describing the continuous separator of Lefeldt, Frederiksen, in his "Creaming Milk by Centrifugal Force," alludes to it as follows:

"In his new machine the drum has about the same as that of the self skimming but not continuous creamer, and the cream is removed in the same way passing along and over the flange of the cover and following the stationery plate, *m*, into the the trough, *n*. Behind the flange, *l*, in the cover of the drum are two small holes, one opposite to the other and below these holes two small tubes, *h*, having corresponding openings in the sides, carrying away the skim milk from the circumference of the drum through the openings in the cover into the space, *i*, below the plate, *m*, whence it flows into the annular trough, *k*, and out through the exit spout. The small tubes catching the skim milk may be turned so that the whole of the opening in the side corresponds with the hole in the cover of the drum. Or they may be so arranged as to place only a part of the opening in connection with the hole. Thus by turning the tubes the exit channel for the skim milk may be narrowed or enlarged at will, regulating the skimming. By turning the tubes so as to entirely cut off the connection the machine may be used as a self-skimmer only, no skim milk being discharged at all.”



Lefeldt's Continuous Creamer.
c, Cream; *f*, Milk in process of separation; *g*, Skim-milk.

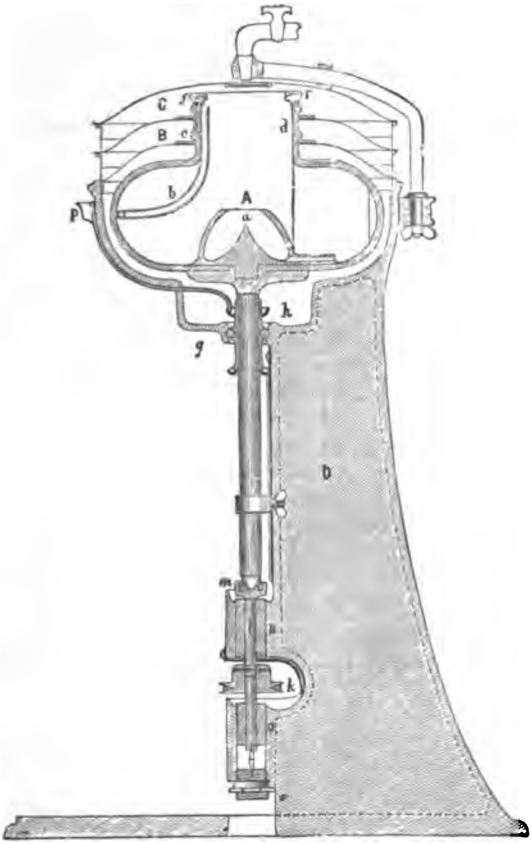
In tracing the history of the inventions of Lefeldt, we have gone into particulars more than we otherwise should have done, because the history of his separator is essentially that of all others; and a description of its mode of operation answers quite well (except of course as to differences of construction) for others.



Lefeldt's Latest Centrifugal Creamer.

In the perfection and construction of the centrifugal separator, Lefeldt was by no means alone, and, at different times after he had introduced his first separator, others entered into competition with him in the work. But all were necessarily based upon the one principle of centrifugal motion, and only varied in the mode of its application.

Among the most prominent of his competitors (at least in the minds of Pennsylvania dairymen) was DeLaval, who constructed the separator now so well known under his name in this and adjoining States.

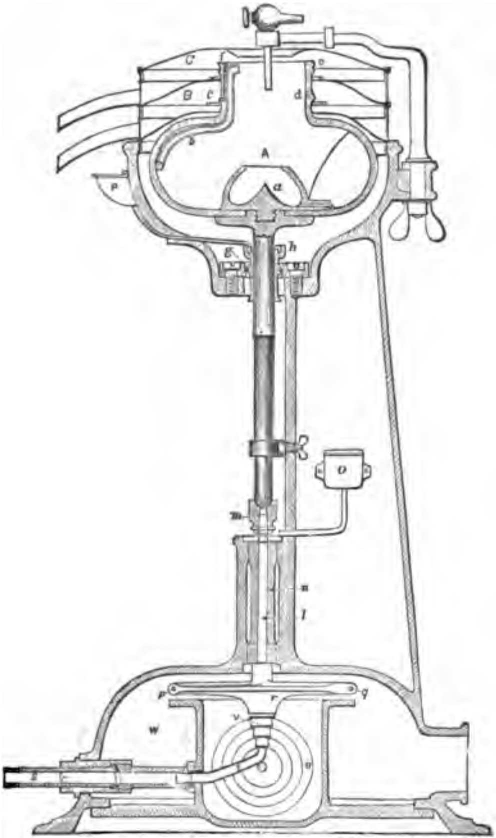


DeLaval Separator.
(Sectional view.)

DeLaval's first attempts in perfecting a separator were caused by newspaper comments upon the first Lefeldt separator, and he at once set to work, independently, on the same line of invention as Lefeldt, and attained as important and perfect results by a different mode of construction, but by the same general principles, the operation of which may be thus explained:

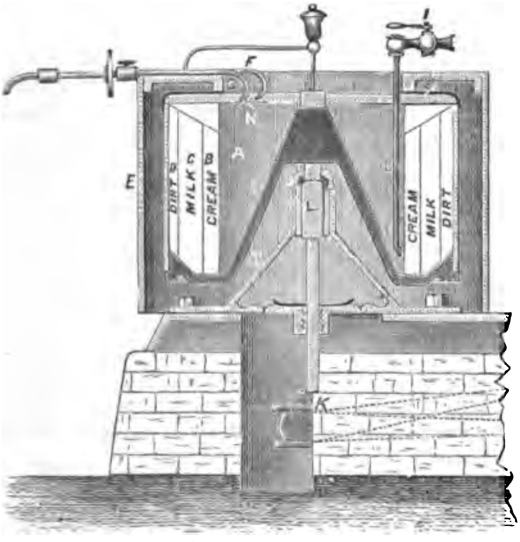
Running by means of a pipe from the receiver, the new milk enters the separator through the stop cock at the top, and falling into the inverted funnel at *a*, is fed into the rotating cylinder through the tube at the bottom and right side of the funnel; this tube is so arranged as to discharge the milk at or near the line of demarcation between the columns of milk and cream in the revolving cylinder; by this mode of delivery, the separation is almost instantaneous and perfect; as the cylinder fills up, the column of cream raises perpendicularly inside of the skim milk, and when its top reaches the opening at, *f*, it is discharged into the upper tin cover at, *c*; from this point it escapes through a spout arranged at a convenient point in the circumference of the stationary cover, C; the skim milk, by the force of rotation, is carried up the bent tube, *b*, and discharged at *c*, into the lower tin cover, C, from which it escapes by a properly arranged spout from the circumference. By a proper arrangement the amount of either skim milk or cream may be regulated, and thus the milk may be "skimmed close" or it may be left rich, as circumstances may warrant.

In the Delaval, as in the Lefeldt machine, the main difficulty is to obtain a drum or bowl of sufficient strength to endure the expansion caused by a speed of 7,000 to 8,000 revolutions per minute; the bowls for the DeLaval separators are all made in Sweden and are guaranteed to withstand a pressure of 330 atmospheres (4,950 pounds) per square inch. This separator is constructed and run upon the same principle as a boy's top, and is so correctly balanced as to, as far as possible, avoid friction; at. *m*, the foot of the revolving spindle sets in a wooden cup, which, by means of a flexible bearing at *g*, permits the spindle to adjust itself to slight changes of position.



DeLaval turbine separator.
(Sectional view.)

The latest improvement in the DeLaval, is the attachment of a turbine wheel near the base of the separator shaft; this turbine is operated by the pressure of steam direct from the boiler and without the intervention of an engine or shafting of any kind; by the use of shafting and belting, a speed of 8,000 revolutions per minute was kept up at the loss of considerable power, but since the attachment of the turbine, a speed of 15,000 per minute may be easily attained, thus greatly increasing the capacity of the machine and the efficiency of the work.



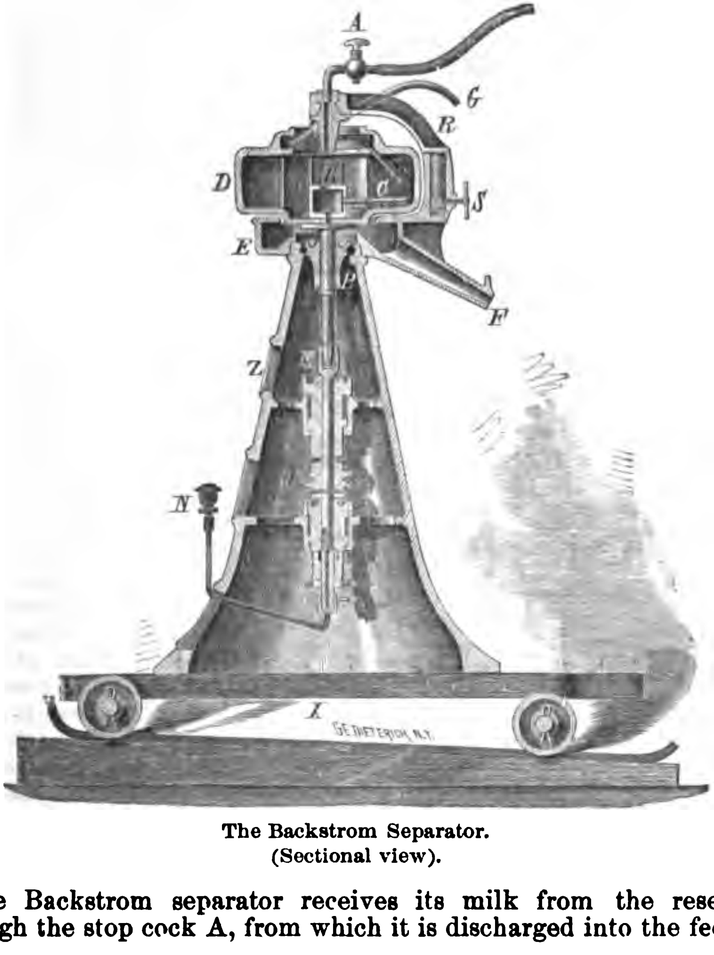
Danish-Weston separator.
(Sectional view.)

The Danish-Weston separator has its drum or revolving receiver suspended from near its upper surface upon a tapering cone, which in effect gives it a perfect balance and enables it to rapidly adjust itself to any sudden changes in position; it maximum speed is 4,500 revolutions per minute, and with this it is claimed it can work as rapidly as any other separator, its operation may be thus described:

A, the wrought steel drum in which the separation takes place; E, a wrought iron casing surrounding the drum; I, the cock through which the new milk is fed into the receiver; C, the tube through which the cream is drawn off and discharged into a vessel detached from the separator; F, the tube through which the skim milk is drawn off and discharged in a manner similar to the cream; N, a plate through which the skim milk rises by means of small aperatures near the circumference of the drum A; the tube, F, through which the skim milk flows is directly over the plate, N.

In its operation the Danish-Weston separator closely resembles those already described. The new milk entering the cylinder through the stop cock, I, follows the tube downward and is discharged near the base of the cylinder where an immediate separation takes place and the two columns of cream and skim milk occupy their relative positions as in the other machines, the impurities, being the heaviest, are forced against the outer circumference of the revolving drum and collect there.

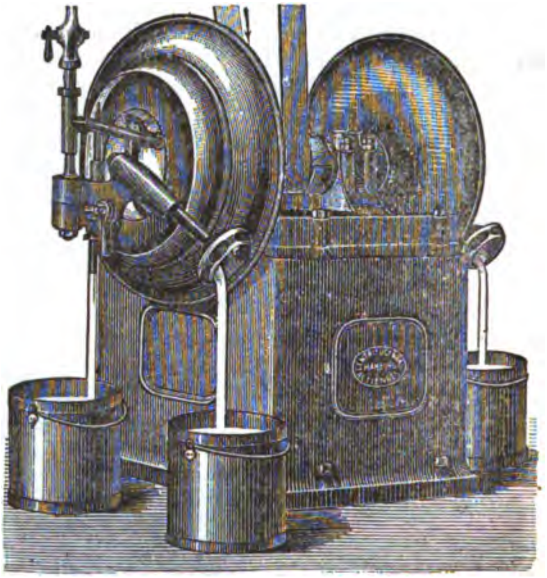
By means of proper set screws, the cream and skim milk tubes may be made to penetrate deeper or shallower into their respective columns and more or less cream may be taken out, as may be desired.



The Backstrom Separator.
(Sectional view).

The Backstrom separator receives its milk from the reservoir through the stop cock A, from which it is discharged into the feeding cup B, which delivers it in the rotating cylinder D, which revolves at the rate of from 7,000 to 8,000 per minute; as soon as the rotating cylinder is filled the skim milk and cream are discharged continuously. The cream flows by its gravity through the outlet at the bottom of the rotating cylinder into the receiver E, and is discharged by means of the outlet at F. The skim milk is taken from the circumference of the cylinder by means of a small pipe and by it is carried into the upper chamber from which it is discharged by the outlet G. which is held in position by the arm R.

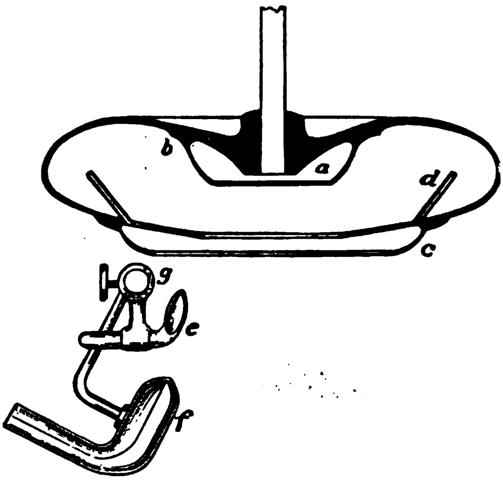
The power is transmitted by an endless rope to the small pulley L, and is thus transmitted to the spindle by friction as is shown at M. The inclined movable truck under the separator is intended to keep the belt always tight. It is claimed for this machine that the cream leaves the machine without having its fatty globule broken, and that this is due to the fact that it is discharged by gravity alone.



Petersen's Shale Centrifuge with new shaling tube.

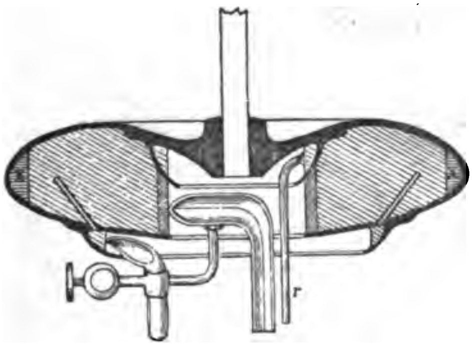
While Lefeldt and DeLaval were perfecting their separators, other European inventors were not idle, and a number of other patents have been taken out in Europe. The machines which we have described already (the DeLaval, Danish-Weston and Backstrom) seem to have gained a prestige in this country which has prevented the introduction of other machines, but as matters of interest to our dairymen, we add a description of other patents which have accomplished the same purpose, though by different means.

In addition to other differences in construction, the Petersen shale separator varies from the others which we have described in having a vertical, instead of a horizontal separating drum or



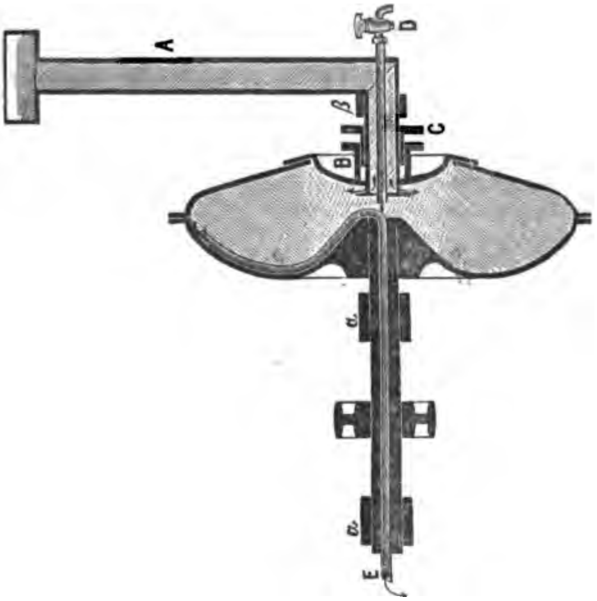
Petersen Separator. Shalers detached.
(Sectional view.)

cylinder. By this change in arrangement two separators may be placed upon the same shaft without in any way interfering with each other. The cream and skim milk are removed by "shalers," which in some respects resemble the appliances used by the Danish-Weston separator. The operation of the Petersen separator is thus described by J. D. Frederiksen:



Petersen Separator. Shalers in position.
(Sectional view.)

"The new milk is supplied through a funnel into an annular reservoir *a*, near the shaft, entering the centrifugal chamber through small openings at a point between the cream and skim milk. Through pipes *d*, the skim milk passes into the annular chamber *c*. By a choice of diameter and length of the pipes *d*, a more or less "blue" skim milk is obtained; the impurities in the milk accumulate at the extreme circumference or corner of the drum. The cream, as well as the skim milk, is removed by knives or "shalers," *e* and *f*, movable around the column *g*, so as to be put out of or into action at will, and to be fixed in their proper position by screws. By continuous shaling off the cream is obtained rather thin and in larger quantities, while by once in a while withdrawing the shaler, the cream may be taken in any desired degree of solidity." The maximum speed of the Petersen machine is said to be one thousand to one thousand two hundred revolutions per minute.



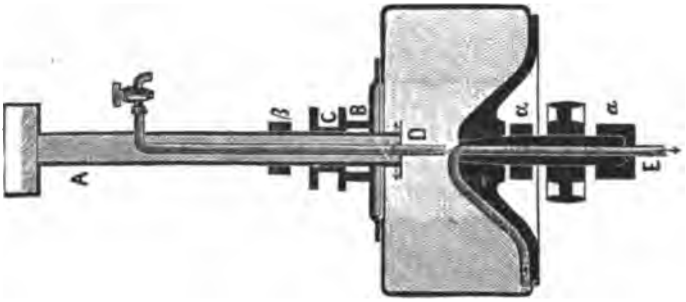
The Pape Horizontal Machine.
(Sectional view.)

The Pape separator, in addition to other points of difference, is made either horizontal or vertical as may best suit the purchaser.

In the engravings. A represents the inlet pipe which is stationary; B, the cover which revolves with the cylinder; C, a revolving box into which the inlet pipe is fitted water-tight; D, outlet pipe for cream which is also fixed; E, outlet pipe for the skim milk, which revolves with the cylinder; *a*, *a*, friction boxes holding the weight of the revolving cylinder and cover.

The peculiarities of the Pape separator are:

First. That its cylinder or drum is closed and is air-tight, the cover B, fitting tightly, and the opening by which the feed-pipe enters being closed by the follower C.



The Pape Vertical Machine.
(Sectional view.)

Second. That in addition to operating by centrifugal force, it also acts by hydrostactic pressure through the medium of the column of milk in the feed pipe A.

Third.—That the cylinder or drum is completely filled and is kept full during the operation of creaming.

Its mode of operation is described by Frederiksen, as follows:

"The drum being started and filled, the milk within takes part in the rotation, while the column of new milk standing in the inlet pipe A, remains quiet. Yet it is exerting a pressure measurable by the height of the milk column. On account of this arrangement the new milk in the inlet pipe forces out of the machine, by hydrostactic pressure, the separated liquids. The cream escaping at the center of rotation through the stationary discharge pipe D, while the skim milk is caught from near the circumference of the drum by the pipe, E, rotating with the drum. The outflow of cream, as well as that of skim milk, may be regulated during the motion by suitable faucets. It is claimed for this machine that, on account of the situation at the center of rotation of the outlets for the separated liquids, they leave the drum in perfectly quiet currents, avoiding the foaming or squirting liable to occur when liquids are forced out of the drum by centrifugal velocity; also that with drums of equal size, the Pape machine, being entirely filled with milk, will do more work than other separators, the centrifugal chambers of which are but partly filled."

The Fasca separator involves modes of dividing the cream and milk not used in any other machine and which Frederiksen thus describes:

"In a vertically revolving drum, much like that of the Danish-Weston and Lefeldt machines, three horizontal discs or plates are arranged, one near the top, another just above the bottom and the third in the middle, all of them nearly covering the entire chamber, leaving only narrow slits at the circumference for the liquids to pass through. The new milk, dropping into the drum, meets the upper plate and following the latter, passes through the openings at the circumference into the second chamber between the upper and middle plates. Being once acted upon by the centrifugal force, it is already partly separated before reaching the middle plate, over the edges of which only the heavier part. being poorest in fat, finds its way down into the third chamber between the middle and lower plates. Here a perfect separation takes place leaving only the blue milk to pass into the fourth and last chamber and move towards the shaft near which it escapes through holes in the bottom of the drum and is caught by a surrounding reservoir which is provided with an outlet pipe. The cream, being met by the intermediate plates, and not having sufficient specific gravity to reach the circumference of the drum, as it works downward, is accumulating between the plates. After seventy to seventy-five minutes it will fill almost the entire space when the motion of the machine is stopped and the cream run off through the outlet pipe before mentioned, which is then turned so as to drop the cream into another vessel apart from that receiving the skim-milk. The machine is then started anew and the process repeated as long as there is any skim-milk left."

Frederiksen gives the following as the points of a good separator:

" *First.* It should be perfectly safe, strong and of first class workmanship. It should run easily, without shaking the least, and without heating. The foundation should be solid, and the revolving parts of the machine should be well protected, so that it may be free from danger.

" *Second.* It should admit of easy and handy cleaning. There should be as few pieces to be taken apart as possible; no screws, or but few, to be taken out; nothing preventing the hand or the tools from reaching every corner; as few sharp corners or bent pipes, &c., difficult to clean as possible.

" *Third.* The construction should be simple and plain, so that any intelligent dairyman may immediately understand it, and run the machine properly and without trouble.

" *Fourth.* The construction should admit of perfect control of the quantity of new milk to be supplied in a certain time, as well as the quantity of each of the separated liquids to be drawn. It is important to be able to control the skimming, not only while the machine is doing regular work at full speed, and supply. but also in starting and closing up the work.

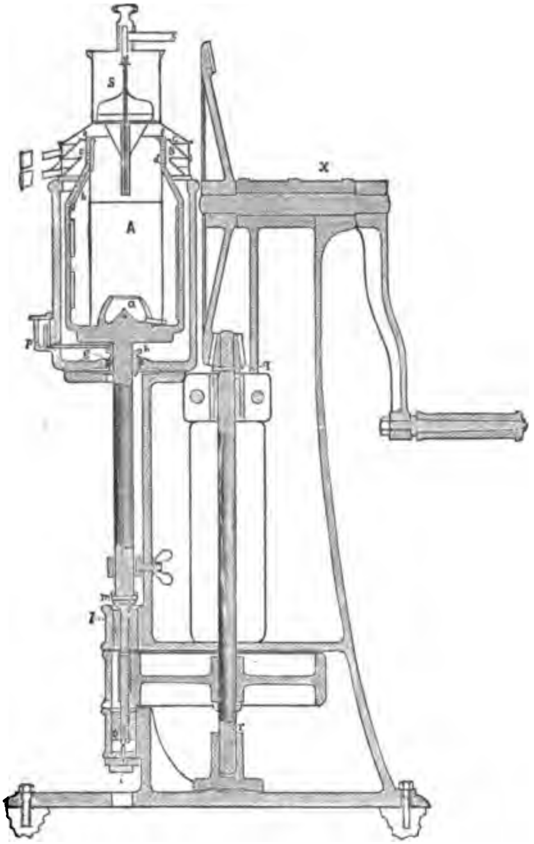
" *Fifth.* The capacity of the machine should be such as will allow the work to be finished in good time. Four hours a day is all that should be occupied in creaming the milk under ordinary circumstances in large creameries. In a month or two, when the largest quantity of milk is received, it may do to run the machine a few hours more, say two hours in the evening, besides four in the morning. In a private dairy the work should be finished in one or two hours.

" *Sixth.* The separated liquids should be discharged from the machine in perfectly good condition. The butter globules should not be cut. and there should be as little foaming of the liquids as possible.

" *Seventh.* The machine should be cheap in the first cost, and cheap to put up. This is of course, an important point to be considered. Still, it is the last one, and the main thing is that the machine be good; for a poor, troublesome creamer, even if cheap (low priced), will be more expensive in the long run than a good one at a high price."

Hand Machines.

The great success attained by the power machines, in increasing both the quantity and quality of the product, soon created a demand for a hand machine suited to the requirements of dairies of moderate size. To meet this DeLaval machines, both vertical and horizontal, have been introduced and are meeting with success. The vertical machine operates in the same way and upon exactly the same principles as the power machines already described, and they are run at a speed of about 6,500 revolutions per minute; at this rate the driving handle to which the power is applied, must make forty revolutions per minute, which is ample for ordinary milk, but with extraordinary thick cream, the speed of the power shaft must be increased to forty-five revolutions per minute. With moderately warm milk and at this speed, it is claimed that the vertical machine will separate 250 to 300 pounds of new milk per hour. By a slight change the vertical hand machine may be attached to steam, water or horse power and its capacity increased.

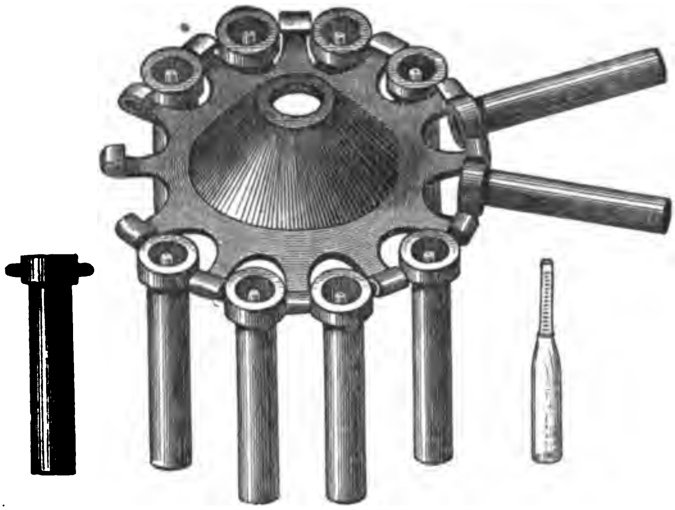


De Laval Vertical Hand Machine.
(Sectional view.)

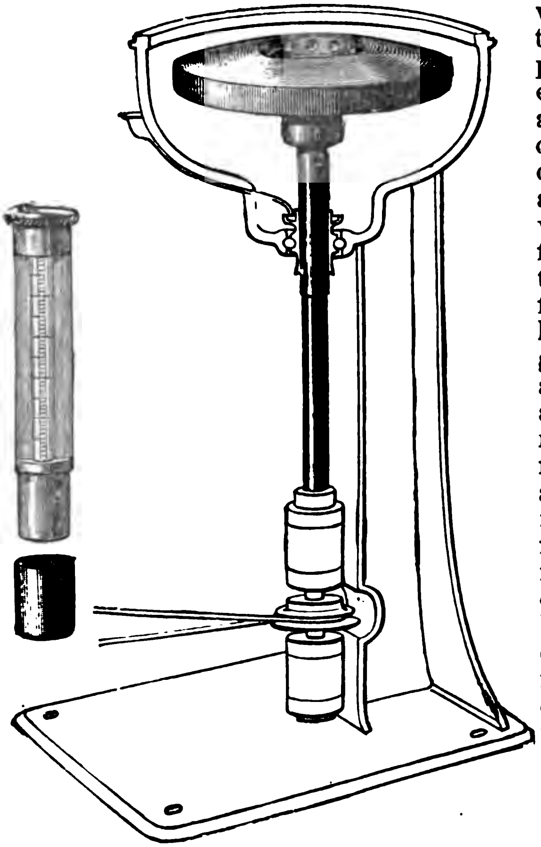
Lactocrites or Milk Testers.

Closely allied to the centrifugal and closely following its introduction are the lactocrites of milk-testers, by which the creamery superintendent may at any time measure the butter in the milk furnished by his patrons. Previous to the introduction of the centrifugal, resort was had to the uncertain and unsatisfactory test of the graduated cream tubes. With the centrifugal came the power necessary to drive the lactocrite which by its verdict should establish the status of each patron carrying milk to the creamery. Attached to the centrifugal (and as a rule they may be adapted to all centrifugals) all samples were submitted to a fair and impartial test, from which there could be given no good reason for an appeal.

The earliest machine for this purpose appears to have been invented by Prof. N. J. Fjord of the Royal College of Copenhagen, who was noted as an inventor of dairy implements. The attached engraving



Fjord's Milk. Controller.



DeLaval Lactocrite.

well represents the Fjord tester so as to make explanation almost unnecessary. A series of graduated glass tubes are introduced into strong cylinders, which in turn may be attached to a rapidly revolving shaft of a centrifugal, or which may be attached to a special shaft for the purpose. Each having been filled with a given amount of milk and all having been given exactly the same number of revolutions at the same rate of speed, the relative amounts of cream in the milk of each pattern was readily determined. So far as a cream test was concerned, the milk testor of Fjord was all, that was required, but it was unsatisfactory to both the creamery and the patrons from the fact that the bulk or measure of the cream was not a fair test for the amount of butter in a given sample. Some kinds of milk were found to produce much more cream than others, without yielding as much or any more butter.

The DeLaval lactocrite, in its mode of applying the centrifugal force, does not very materially differ from that of Fjord; like that of Fjord it may be used simply as a cream measurer, but in practical use the sample of milk is first mixed with a portion of acetic acid, and heated before being introduced into the cavities of the machine; by this plan the actual butter in the sample is separated and is found on top of the milk.

In relation to the use of this plan for testing the milk of patrons, the secretary of a creamery making up 20,000 pounds of milk per day, writes as follows: "It stands to-day the great social anchor of the ——— creamery, barring all opportunity for fraud, accusation or imputation, places every dairy connected with the creamery fairly upon its own merits. Since the adoption of this machine our milk has increased from one-quarter to one-half pound of butter to the one hundred pounds of milk; our patrons seem to understand it, and it is giving general satisfaction."

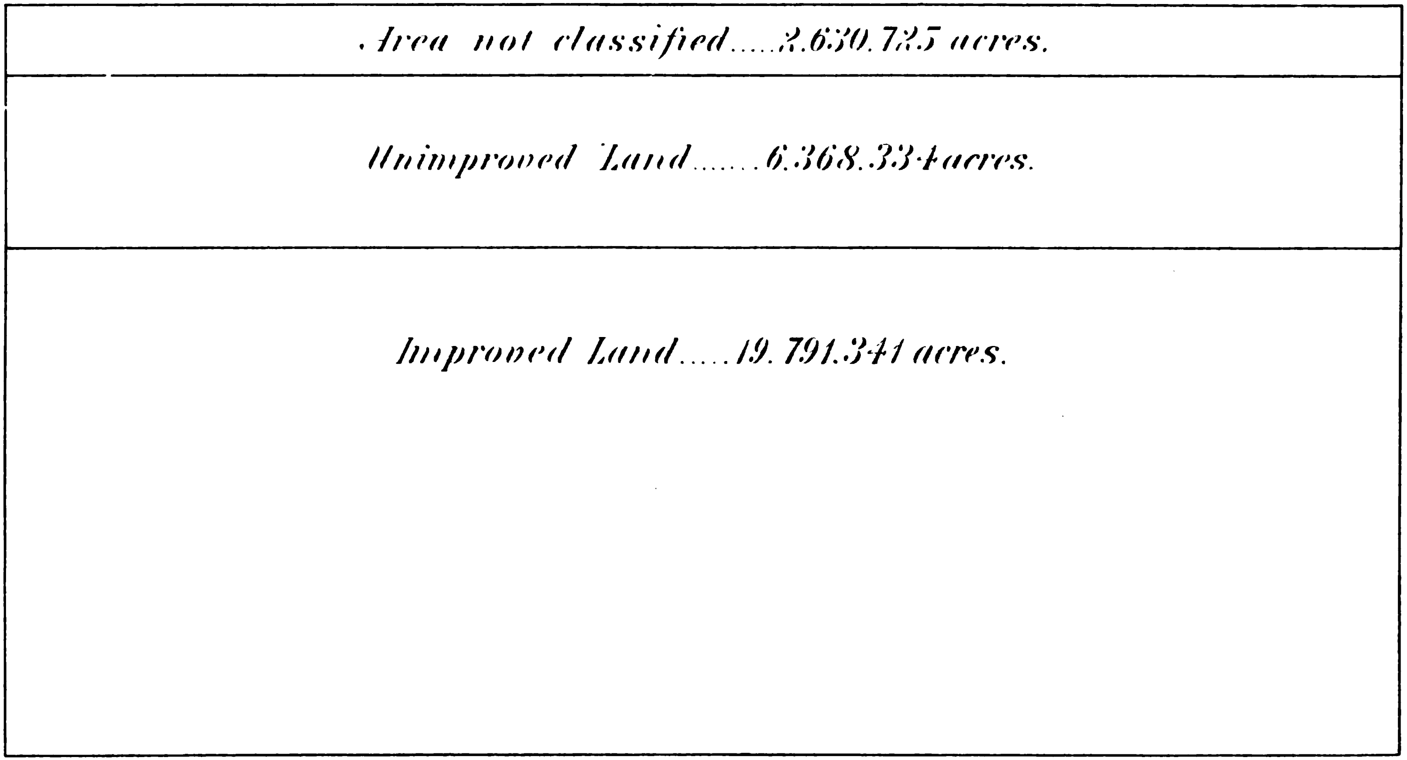
The greatest benefit attending the introduction of any exact *butter* test at a creamery is that each individual patron will stand exactly upon his own merits, and be paid for his milk exactly in proportion to its butter value, which is the gauge for the creamery. Those who by a careful selection of cows and the use of rich food, make milk rich in butter, will receive a recompense for their trouble and expense, while the careless patron will be the loser by his carelessness.

A PRACTICAL TALK TO THE MAN WHO PRODUCES MILK.

By W. D. HOARD, *Ft. Atkinson, Wisconsin.*

[An address at the Washington Institute.]

This is the first time I have had the pleasure of meeting with the farmers and agriculturists of Pennsylvania. Although I have been considerably conversant with the worth of Pennsylvania for a good many years, I never had an opportunity to know or engage in its discussions or compare its ideas, as I have to-day. You know that the Widow Bedott said, "We are all poor critters;" it don't make much difference where a man comes from, but a good deal of difference where he goes to. Whether it is in Wisconsin, or in Pennsylvania, or in New York, the sharp practical questions that come to us as farmers are of about the same import. The question is with him everywhere, how much am I getting for my time? how much am I getting for my work? what sort of a success am I making of myself? Farmers go up or go down just in proportion to their mental strength, just the same as merchants, just the same as manufacturers, just the same as everybody else; and in proportion to the amount of brains and ability and strength of judgment that the farmer brings to bear upon his problems, is he usually successful. I think the new ideas that have found an expression in the United States, the new interest taken in agriculture, the day of farmers' institutes, embody a good deal of hope for the young farmer. The old fogies will have to go. A good many of them are so rock-rooted in their prejudices that you couldn't budge them except by a dispensation of Providence. Other of the old farmers are progressive and alive, with minds bright for the problems of the day just as they ever were. I have in my mind a man in Wisconsin



DIVISION OF LAND IN PENNSYLVANIA.

Total surface....28.790.400 acres.

whose head bears the frosts of seventy years, and who is one of the most progressive men we have in the whole State. I allude to Hiram Smith, a man who has a large heart and brain, a man who looks out upon the question of success with the broadest thought, and hails every invention and every improvement with a glad heart, a ready hand and quick judgment.

Now, these men are taking hold of the agriculture of our country to-day, and there is hope for its redemption. The fact is, we have been going upon guess-work; in a thousand ways we have been acting absolutely without intelligent judgment; and I believe our farmers, without understanding it, have been denying to our business that which every other business in the world brings to it, and that is brains; it has been so in Pennsylvania, and in Wisconsin, and in New York, and everywhere, to-day there is a call for improvement in this line.

I often think, when I look over the agriculture of my own State, where it was a few years ago, after having emerged from the wheat rage, when men supposed there was no other salvation for the farmer but to plow and sow—a stupid debauchery of wheat growing—coming out of it like drunken men, reduced in strength and without spirit. I see Dakota going the same way to-day, and I look back and see where this wheat craze started in the Genesee Valley in New York. It went from one State to another until to-day it is in Dakota. When I consider these things and think how little we learn, I am reminded sometimes of the Irishman, who, passing through a thick wooded piece of ground with a sinkhole in it, discovered a man sunk in the morass. He rushed up to drawling sort of a Yankee and said, "come over for the love of God, there's a man sunk in the morass;" the Yankee looks around with a sort of drawl and says; "is-that-so? how-far-is-he in?" "Well, sor," says Pat, "he's up to his ankles;" "Oh well," says the Yankee, "he'll get out;" "No, sir, he'll not," said Pat, "for, be gorra, I forgot to tell you he went in the other end first." It makes a heap of difference whether a man is sunk in a morass up to his ankles one end first or the other; whether the head is submerged or not. Now, we need to-day, on this question of milk production, some practical, close, intelligent thought. We are confronted with times when we must be alive to the solid environment that is around us. We can no longer hope for tariffs or anything else to hold us up, whether we are milk producers or cheese producers. The fiat of to-day has gone forth that the man that will not produce a profit will lose money.

We find in the production of milk in particular, that we have been going on with prejudices in our minds. Prejudice has the peculiar quality of distorting our judgment. I want to state an incident that will illustrate it. I was in the city of Independence, Iowa, on a very cold day in 1868, and a coal fire was burning red hot, a man came in with one short leg and marched up to the coal stove and bent over it to warm himself, a man sat on the other side who was a little tight, and he looked at this man bending over there warming himself, and thought it was very curious that a man should warm himself so out of shape, so he spoke to him and says, "My friend, are you a sound man?" "Yes, sir." "Are you as well as usual?" "Yes, sir." Well, all I've got to say is, that if you're a sound man you had better get away from that stove; you're warping like the devil.

Now men undertake to do business in company with prejudice, and it warps their judgments. I want to address you a few moments about the economical production of milk. These are problems that have been a life long study with me; they have been practically so for profit; they have been so in a thousand ways in matters of education, and I want to talk a few moments in a practical way upon this question. The figures of the U. S. census show just what Pennsylvania was doing in 1880. New York is in about the same category, the production of about three thousand pounds of milk per cow, or fifteen hundred quarts, is the average production in Pennsylvania. The average production in New York, was about one hundred and twenty pounds of butter. If it is excellent milk, say one hundred and thirty-three. Now, this is altogether too low as an average, and it is the average that is working the mischief everywhere with us. Now comes the question—what causes it? First, the average farmer does not have a dairy understanding of what a good cow is:—he has not a sufficient understanding of the outlines of a dairy cow, or the functions of a dairy cow, or a distinct understanding of dairying, how to care for her, how to feed her, how to care for the butter or milk, how to handle the dairy cow. Now, if the farmer had a good, clean cut understanding of the dairyman's business, or of the dairy cow, would he be handling cows in this State of Pennsylvania that only produce three thousand pounds of milk per year? Would the Pennsylvania farmer do this thing, if he was posted in his business? I think not. It is the same in Wisconsin. It is this that causes the low unprofitable average. Now, in contradistinction with this low average, we have men in all communities who are showing what can be done. We have men in Wisconsin who are producing three hundred pounds of butter a year a piece from their cows. We have large numbers producing two hundred. I spoke to you of Hiram Smith, a man who carries a hundred cows on two hundred acres of land; a man who is solving the problem of close and economical production of milk and butter, and his average for one hundred cows is a little more that two hundred pounds of butter. He could have made it larger, if he would add to his judgment in handling a judgment in breeding; but he has mainly bought his cows.

We have men producing three hundred pounds of butter per cow in herds of from fifteen to thirty. Now, the returns range, as you see here, from about $30 to $80 and $90; that is too wide a range. I have had occasion to look this matter over and I have made up my mind that a large proportion of all cur cows, both in Pennsylvania and New York, are kept largely at a loss. Go through the dairying districts in New York to-day, and you will hear plenty of men say they can't make any money at dairying. When you investigate the matter, you will find they are carrying useless cattle. It is so in Pennsylvania. What does it cost to keep a cow here? It costs for pasture the interest at the going price of the land required with the cost of fencing and the taxes added—no less in Pennsylvania than $10 a year, if I have the figures correctly. Will some one who knows what the average cost per acre is in Pennsylvania inform me what is the average number of acres that will pasture a cow? The average in Jefferson county, Wisconsin, is three acres; the average in the State is about four. The average price of our land is $40 per acre; in Jefferson county much of it sells for $70. The legal rate of interest is seven per cent. If it takes three acres of land, we have, at $40 an acre, $120, which would give $8.40 of interest; add to that the cost of fencing and taxes, and you easily have ten dollars as the cost of the pasture of a cow for a year. It will take two tons of hay, this year worth $12 to $13 a ton, usually worth $8, to barely keep the cow alive for 180 to 200 days in winter. Now, you have $26 as the cost of keeping a cow. Can you keep it in Washington county, Pennsyluania, for $26 a year? You have a yearly average in your county, if I am correctly informed, of about three thousand pounds of milk per cow, worth in butter about $30; in cheese about the same. Now, you have the average, with you, of $4 a head, as the average profit for the cows of this county. Is it enough? I think I hear you say no. Well what shall be done? Take the men who are taking their milk to cheese factories or creameries—I have sixty four patrons bringing milk to me. I find these men range in the profit of their cows from $70 a head down to $30. I find it very hard to convince the $30 man that there is a road out of the difficulty for him; I find the $70 man is actively alive to making the cow do more if possible. The difficulty lies, I believe, right here, in the amount of intelligence on this question the farmer possesses. He has not made the cow a study; she is worth studying just as is the race horse and the driving horse. The mother function, the function of maternity, which is the basis of profit in her, is as clearly a matter of heredity as any other function. Now, in my talk to-morrow upon the specific dairy cow, based upon physiological grounds, I will endeavor to show, by the lines here drawn upon the diagrams, the difference between the dairy cow and the beef cow; the reasons why all these conformations are as they are. I want to show how things work in Wisconsin—you can take the same doctrine with you in Pennsylvania; if I had the figures of your order production I have no doubt I could show the same contrast. In Wisconsin, in 1865, we took a State census, a very thorough one, calling for all the figures we could get, and the census takers were specially instructed on these questions and they took every bit of data they could find. We produced that year thirty-three million pounds of cheese and thirty-eight million pounds of butter, and we had six hundred thousand cows to do it with. I want to call your attention to the differences that occur in the different counties. The county of Sheboygan is the largest cheese county we have, producing this year about seven million pounds of cheese. The average earnings of a cow in that county in 1885, were $55.11; the average earnings of a cow in Taylor county were $9.15; the average earnings of a cow in Shawmut county were $3.43; the average earnings in my own county of Jefferson were $44.11. Now, what caused these differences? It is the difference in the individual farmer himself; it is the difference in the amount of study he puts into his business. In my own county, the town of Watertown is one of the best towns in the county. It produced in 1885, eighty-three thousand pounds of butter; the town of Koshkonong that I reside in, produced 127,000 pounds. The town of Watertown has a better soil. The farmers of that town made no sort of study of the dairy question. They produced their butter and sold it at the country crossroads; they paid no attention to the intelligent study of the matter; their butter sold in 1885, on an average, for twelve cents and eight mills a pound. The butter in my town of Koshkonong sold for twenty-one cents and eight mills a pound. Now, what effect had that upon the revenue of the farmers of Watertown? Had they taken the pains to produce—saying nothing at all about any more butter, but taking that which they did produce, and the handling of it—had they bestowed proper thought and intelligence upon this matter as they should have done, it would have made a difference to them in the selling price of their butter, of $7,520 or more than their entire town taxes. It would have given more; for every man, woman and child, $3.71; and yet, the farmers of that town never bestowed $50 upon their education in this particular. It amounted to a loss of, say, over seven thousand dollars a year to them. It is just so in Pennsylvania, thousands of farmers think they cannot afford to be intelligent and well posted but they can afford to lose ten times as much as the selling value of their products because of ignorance. Is that good sense? There are valuable lessons to be learned all the time if we are but alive to them.

We started in the west, for instance, with warming the water for our dairy cattle. I remember about four years ago a remark made by John Boyd, of Chicago, that he had found a cord of wood was equal to two hundred bushels of corn in the production of butter; and Mr. Grinnell arose and asked: "How do you feed that cord wood?" He replied it was not fed, but that the wood was used to warm the water with. And in this matter of giving milk, and particularly on this question of producing it economically, we find there is often such a thing as a very costly ignorance. In my experience with my own cattle, I found that warming the water from the average temperature of the brook that ran by the barn, which was about forty degrees, for remember in the winter time, when the water is running in the brook, it is ice water; I found that warming the water produced a difference of twenty-five per cent. in the milk and about ten per cent. in the butter production. Now, think of that. It costs say five cents a day to warm the water for the whole herd of cattle; it cost me only five cents a day for soft coal, and I have to pay for coal up in that country. But with a little device which cost me about twelve dollars, I can warm the water for the whole herd at an expense of five cents, and carry it up to seventy degrees. Now, we find a dairy cow drinks on an average, when in full flow of milk, from eighty to one hundred pounds of water a day. What is the effect upon the cow's production of milk in winter? We force this cow to engage in the production of milk, which requires a relaxation of the whole system; we force her to travel to the brook every time with the wind blowing cold, and in a relaxed condition of body, and force her to drink cold ice water, coming back shivering, she stands in her stable and we wonder that we don't get any milk. A reasonable thinker, reasoning physiologically, could see the very moment you force that animal to drink cold ice water, you shrink every milk secretion. The next question that came up was, how shall we feed for milk and butter? And we went along in this matter until we were brought to see that most of us were feeding without any intelligence on the question. Now, there is a right way to feed for butter and a right way to feed for milk. For instance, a great many of our farmers supposed timothy hay was a good milk and butter food, never dreamed of anything to the contrary; but hard experience taught us finally that there was something a great deal better; and the result is to-day that we are producing milk at an expense of not over fifty per cent. of the cost three years ago. I can produce as much milk and butter to-day on eight cents a day as I could three years ago on seventeen cents a day. Now, gentlemen, there is where the tariff can't beat me. If I can reduce the cost of production down to the minimum, I don't give a snap where they put the tariff, I am ahead of the tariff every time. So I find that the study of this question should begin with the farmer himself at the point of production. By the way, I am not a low tariff man by any means. I am not speaking of politics, but I am saying there is a tariff I have got more interest in altogether, first, and that is the cost of production of the milk. Now, as I said, it costs at least twenty-five to thirty dollars to keep a cow, and if the cows on an average only give about thirty dollars worth of milk, where are we in the end? Warming the water has increased the production; feeding corn fodder, grown specially for the purpose, increases the production. Now, I refer to the question as to what is a dairy cow, and what is not; what does and what does not belong to the dairy cow? An old man once said to me, "Confound your cows; I ain't going to be tied to the tail of a cow; I want a business that I can stick it in the ground and go down town and play pitch." It was the same way in the wheat business; they would say, Oh, Lord, bless this wheat, I don't care anything about it myself. The difficulty first is of judgment as to the kind of cow. We must get this notion of general purposes out of our heads; if we are to be profitable milk producers, we must reach for a dairy machine. What sort of a man would he be who would go out to day to harvest his grain with a sewing machine? Suppose I should come through this community and offer for sale a combined mowing and sewing machine. You would laugh in my face. Yet to-day there is prevalent in the minds of all our farmers a notion most mischievous, that stands resolutely in the way of profitable dairying, and that is the idea of a combined machine for the purpose of making beef and butter. Men talk to you and to me and say, the last use of a cow is for beef. I scout it. The last use of a cow is an honorable burial for the good she has done. I might as well say the last use of a race horse is to be used in a lumber camp for the purpose of hauling logs.

This idea of general purposes has become so engrafted in our belief that there is an idea among people to-day that you can keep a cow for eight or ten years and then profitably sell her—make beef of her. I beg leave to differ from that; and I will guarantee to show any man that keeps a cow for eight years with that purpose in his mind, of finally turning her to beef, who buys her on account of her size, that he has lost a great deal of money. Follow me for a moment. The German experiments, covering twenty years and thousands of experiments, in discovering how the assimilation of food was brought about, found it takes three distinct divisions. That when she was making her growth the food for growth was the first demand; that when she stopped growing, the food was the first demand of the daily support of the constitution, the weight and form, and, third, the food of production. Now, what do they find about the food of support? When we speak of feeding for support, we say an animal weighing 1,000 to 1,500 pounds requires from two and one-half to three per cent. daily to maintain the live weight. Professor Sanford, of Kansas, says that the support of the live weight of a pig was two and one-half per cent. of the food a day. I have, as an auctioneer of cattle, often found when I was called out among farmers to sell their cows, that a farmer will pay ten dollars more for a cow weighing 1,300 pounds than he would for a cow that weighed 800 pounds, when to my cow judgment the 800 pound cow was worth double the other for dairy purposes, and yet he was buying the 1,300 pound cow for dairy purposes. I would go to him and say, "did you buy that big cow and pay what you did for her because she would give more milk than that other cow ?" "Oh, no, I didn't do it for that, but for the reason that when we get through milking her she will make a good chunk of beef."

But he bought that cow. The average life of a cow is eight years; if well cared for, you can make it ten, but after eight, the rule is, a cow commences to decrease in worth. But suppose we follow this cow for six or eight years, we suppose we keep her say six years, a man buys her with the idea of turning her, when he is through with her, into a chunk of beef. He paid ten dollars more for that extra 500 pounds, if it costs, according to the German experiments, say three per cent. to support the life of the animal, and hold that weight, three times five are fifteen, or the consumption every day of fifteen pounds of food, the equal in value of meadow hay. Now, fifteen pounds a day amounts to 5,875 pounds in a year, in six years it will amount to seventeen tons and a half. The 500 pounds, the support of it, have cost him the value of this food for the privilege of selling it at the end for old cow beef. You think that is an extravagant statement, but it is not so extravagant, if you stop to figure. I lay it down as a principle one. I have been making it a study closely and thoroughly, that no man can afford to pay for beef or weight in a dairy cow. If a cow has the outline and the performance in her, that is the end of it with me. If he buys a dairy cow paying a single penny for size or weight, with the idea of using that weight, keeping it or supporting it and finally selling it for beef, he has lost money. Now, here is one of the many leaks that come to the dairy business. We don't send men to Congress on account of their avordupoise, we don't select our statesmen, nor select our wives, nor establish our freindships on account of how much people weigh. Why shouldn't we consider the outline of the cow, independent of weight, when it is a well known physiological fact, that the question of motherhood, is not dependent on size. I believe in a medium size not exceeding 1,000 pounds as an average.

I had a little cow myself last winter, a three-quarter Jersey cow weighing 800 pounds. The little cow I speak of calved the 21st day of January and I sold her on the 25th day of April. I kept a correct record of her milk. From the 25th of January to the 25th of April this little cow gave me 3,240 pounds of milk and 160 pounds of butter in just ninety days by the oil test. She received a ration costing each day fourteen cents; but it was a ration that was put up with the best judgment I had for the production of butter. Now, that cow earned for me, at twenty-five cents a pound, forty dollars in three months for butter alone, and her skim milk besides. Now, would I take that cow and pay for her on the score of size or weight. I look at her just as I would look at a race horse, just as I would look at Jay Eye See, because he only weighed 900 pounds I would not refuse to bet on his getting there. We must look at the dairy cow in the same light.

So, when we come to consider a dairy cow we find ourselves confronted with the fact that it is the outline, the heredity, the internal construction of the cow for our business, and not her weight; that weight is an expensive thing to carry for a number of years. When we come to the question of beef we are on another line. For feeding a dairy cow, the best formula I have tried, I think, is the same formula laid down by the German scientists; that is, two pounds and a half of nitrogenous matter, that which makes muscle and bone, and twelve and a half pounds of starch, or that which makes heat. Now, if I feed my cow twenty pounds a day of cut fodder, corn grown especially for that purpose, four pounds of corn meal, six pounds of bran and a feed of five pounds of clover hay. We have established very nearly this nutritive ratio of one to five. Every wise feeder will watch the appearance of the hair, the condition of the nose and the character of the excrement, and thus determine whether she can take more or not. Every cow is born with her individual limit of butter fat to other solids in her. That is what we call the law of proportion. Why was it that Princess II. gave forty-six pounds of butter in one week, and thousands of other cows cannot be made to give over ten? Why was it my little cow gave me 160 pounds of butter in ninety days and the Holstein cow that weighed 1,600, I couldn't get her to give the half of it. My friend says she was not a good cow, But that is a question of the law of proportions in solids. Now, follow me just for a moment. Every cow is born with her individual limitations in her. She may never be fed intelligently; never fed up to those limitations. We will say her limitation is four per cent. butter, three and one half per cent. casein, one-half of one per cent. albumen and five per cent. milk sugar. You know in every hundred pounds of milk there is eighty-seven pounds of water. A cow's law of limitation is a peculiar one; it will pay you to study it; it has paid me. The extreme limit of this cow's butter fat may be four per cent. Step over there and give the same feed to another cow and it may be six per cent.; another cow may be eight per cent. You never can tell what your cow is until you feed her up to her limit. When that is reached she will appropriate her food to the making of flesh or throw it off undigested in the excrement.

Prof. Henry took three cows, showing how peculiar is the law of limitation in these cattle. He took a grade Shorthorn cow, a grade Jersey cow and a full-blooded Jersey cow, and fed them each a ration costing seventeen cents a day. The grade Shorthorn cow took her ration and gave him a pound and two ounces of butter. The cows were fed for a week before the experiment was made. The grade Jersey gave him a pound and nine ounces of butter, and the full-blooded Jersey gave him a pound and fifteen ounces of butter. Reckoning the value of the skim milk, the Shorthorn gave thirty-four cents a day. On seventeen cents, the grade Jersey gave forty-five cents a day, and the full blooded Jersey gave him fifty-six cents a day. Now, why was it that here is a cow that would take the same feed and give a pound and fifteen ounces of butter, and here is another which would give him only a pound and two ounces? And on that feed the Shorthorn cow commenced to flesh and improve, showing that she had struck her limit. She could carry no further the assimilation of the butter feed, but she had commenced to turn it into flesh. On that same feed the other cow barely held her own flesh, showing a higher limit in her and the largest per cent. of profit. Here is a physiological principle that means money; it means return for time; it means return for labor. Why was it that at the Minnesota State Fair, the Holstein cow Tritomia walked away with the prize over all the cattle there, the Jerseys and all else, and made more butter in twenty four hours than any other cow? Simply this, that she was the best cow. Now Mr. Wale, her owner, tells me he has taken twenty-five pounds of butter in one week from that cow. If you saw the cow, you would be impressed with her as a cow of great capacity. I had the pleasure of judging her among forty-eight Holsteins at the State Fair of Minnesota. She is, reckoning strength, a powerful looking cow, with the whole outline indicitive of power and strength on this question of butter. She is a butter Holstein with the butter temperament stamped upon her just as clearly as the Goddess of Liberty on the silver dollar. Among forty-eight cows I could not but give her the premium. It was met with sneers. Men said on the grounds, "that man is a fool, giving that cow the premium when there's lots of smooth, handsome cows here. He don't know what he is about." And I began almost to believe it myself. The result of it was I said, "this cow is in the test, the test is not declared yet—it is not through. It will be declared to-morrow. I will risk my judgment upon the outcome of this cow. Fortunately for me, Tritomia bore the honor. You know the test she made, more butter than any other cow in the lot; and there were Jerseys and other Holsteins in the list. Now, when farmers look at the dairy cow and study her from a physiological standpoint and seek for an animal that shall bring the largest profit as a butter or cheese machine, we will hear less about dairying not being a paying business. We are doing business, and being forced by the low prices to a consideration of these principles. We must produce our butter at a cheaper rate. Wo must get butter machines to produce it with, and must understand and study this cow question from the standpoint of profitable dairying.

THE ELEMENTS OF SUCCESS AND FAILURE IN DAIRYING.

By EASTBURN REEDER, *Member from Bucks.*

As in all other industries, success or failure in dairying, depends upon the amount and kind of attention given to it. I will not attempt to trace the history of dairying, beyond the limits of my own experience, covering a period of between thirty and forty years. In those days the farmer (for we had no dairymen then) took his butter to the village, or country store, and traded it off for dry goods, groceries, and so forth, to supply the wants of his family. To sell butter for the *cash*, was a thing comparatively unknown. The product of the dairy was then considered but a small item on the farm account. No pains was taken either in the manufacture or in the preparation for sale. It was shaped into rolls, or packed into tubs, or crocks, and sent away with as little trouble as possible. In the progress of time a few farmers began trying the markets of the more distant cities. Long journeys were undertaken, occupying two or three days, according to the distance travelled, to convey the products of the dairy, as well as the other produce of the farm, to market. These journeys to market, in the ordinary farm wagons were expensive, as well as laborious. The trip to market in the distant city, could not be made without a cash outlay of three or four dollars, which beside the wear and tear of team and wagon, detracted greatly from the profits on the produce sold. Bad roads, as well as bad weather, had to be encountered. To obviate the former, turnpikes were built, the tolls upon which increased the expenses. Generally the farmer had no friends or acquaintances in the city, and must sell his butter to grocery store-keepers, to commission men and dealers, who, in their turn, must have their profit of five or ten cents a pound, which the farmer could have had by furnishing it directly to the consumer.

Such is a very brief outline of the methods employed in dairying, when I commenced farming in the spring of 1854. The average cow made about two pounds of butter a week, or one hundred pounds in a year. But very little attention was paid to dairying, as a branch of the industry of the farm, and not much effort made, either to increase the quantity, or to improve the quality of the dairy product.

A great change has been wrought during the last thirty years. The dairy industry has been as completely revolutionized, not only as all other industries of the farm, but as well as every industry of the State, or nation. Old methods have been succeeded by new. Market wagons and turnpikes have been substituted in a great measure by express companies and railroads, in conveying the products of agriculture to market. New and improved breeds of dairy stock have been introduced. New methods of manufacture of dairy goods have been adopted; new dairy utensils have been invented and come into general use. Instead of the old-fashioned native cow, we now have the improved breeds of Jerseys, Guernseys, Ayrshires, Shorthorns, Holsteins, Devons, etc. The butter cow must now make from two to three hundred pounds of butter per annum, and the milk cow must yield from five to ten thousand pounds of milk in a year, or they are not considered as worthy of retaining their places in the dairy. The old, open air, shallow-pan system of setting milk, has been generally superseded by the newer, deep can, submerged system; which, in its turn, is also being supplanted by the centrifugal machine, which rotates the cream out of the milk almost in the twinkling of an eye, and is a most marvellous human application of the principle governing the motions of the planetary and stellar systems of the universe.

Location.—One of the first things to be considered by the dairy farmer, is the location of his farm, both as regards the character of the soil, and its situation with reference to his intended market. We cannot all of us be located near our large cities; neither are the best natural dairy farms always to be found in their immediate vicinity. We have in the State of Pennsylvania, according to the census of 1880, fifty-seven cities and towns, containing a population of over 4,000 inhabitants. This is very nearly one large town or city for each of the sixty-eight counties of the State. We might very readily, create and establish good home markets for our dairy products, to a far greater extent than has yet been done, or is even now considered possible. The days when dairy products, handled and sold to consumers by middle-men and dealers on a commission, will yield a profit to the producer, have passed. So great is the competition now, that the producer must sell directly to the consumer. This can only be done by home markets, the best system of political economy. We should not be seeking foreign markets, but should rather be looking for, and building up, our home markets. Expenses of transportation will be diminished—consumer and producer both be benefited;—the former by being supplied with a better, fresher article at a less price, and the latter, by cash sales and quick returns, can afford to sell at lower prices, as time is saved and expenses of marketing lessened. This I believe to be the true principle of successful dairy management. In politics, every man is known and counted, his position located; so in dairying, every dairyman should have his customers, who are themselves the consumers. Even in our large cities, this is every year growing more and more to be the case, and the time will eventually come, when every family will have their butter-man, as they now do their milk-man, their butcher, their baker, or their grocer.

Butter, like bread, and meat, and fruit, and many other food products, is best when eaten fresh. It is not necessary to have it a month, or six months, or a year old before it is consumed. The old system of packing and holding the summer product of butter, for consumption the following winter, is fast growing into disrepute. Under the new system of things, good butter can as readily be made in winter as in summer, and I have never yet seen butter that had been packed or potted that was equal in flavor and quality to that fresh from the churn. Those who are accustomed to the daily use of good, fresh butter, have their tastes so educated, that packed and comparatively stale butter, cannot be palmed off upon them. Rapid and cheap transit makes a weekly supply of fresh butter for table use possible for every family in the land, and we are fast approaching this condition of things, and should make our calculations accordingly.

The *second* object in importance to accessibility to market, is the character of the soil and the water supply of the dairy farm. It should be abundantly supplied with pure spring water, and the soil should be well adapted to the growth of grass and corn—both staple articles in dairy production. If these cannot be raised they will have to be bought, and it is better to raise our own feed as far as possible. Good dairy farms are not unfrequently found in mountainous districts. The water supply is generally colder, purer and better, while the valleys are often more fertile than the land of more level districts. You have in this county, in this borough of Warren, a population of about 3,000. Although each family to average five persons, there would be 600 families to be supplied, and each person to consume half a pound of butter a week, which is a low estimate, there should be a market here for 1,500 pounds of butter a week. This would employ thirty dairymen, producing fifty pounds of butter a week, to supply this demand for butter.

I have said that the only way now-a-days to make anything in dairying is to sell directly to the consumer and obtain top prices. There is always, in our larger towns and cities, a difference of from ten to fifteen cents a pound between the wholesale and retail prices of butter. Take the market reports of either the Philadelphia or New York daily papers—for example, we have from the Philadelphia *Press* of November 14, 1887, the following quotations:

"*Butter.* The market ruled firm with a good demand for all desirable table grades. Supplies of strictly fancy creamery were very small, and this class of stock readily brought twenty-seven cents. Fine and choice dairy makes were scarce, and in good request at full rates. Held butter was dull. Prints were active and strong with an improving tendency. *Quotations.* Fresh creamery extra, twenty-seven cents. June creamery extra, twenty to twenty-one cents. Bradford county and New York state tubs extra, twenty-four to twenty-five cents. Western dairy, best here, sixteen to eighteen cents, choice would bring nineteen to twenty cents. Pennsylvania creamery prints extra, thirty cents, exceptional lots, thirty-one cents."

Let me analyze this single market report, for it teaches us several important lessons.

First. The prices named are wholesale prices. The retail prices are, as I happen to know, from ten to fifteen cents a pound higher. For example, in Pennsylvania creamery prints extra quoted at thirty to thirty-one cents, when supplied to family customers by the creamery-man or dairyman from forty to forty-five cents per pound is realized.

Second. Note the difference in price and in demand, between fresh and held butter, fresh butter twenty-seven cents, June butter twenty to twenty-one-cents, a difference of six or seven cents a pound.

Third. Note the difference between print butter and solid packed; print butter thirty to thirty-one cents. Bradford county and York State tubs twenty-four to twenty-five cents, a difference of six or seven cents a pound. The dairyman should read, and carefully study the market reports. He will thus see what is wanted, and know what he should strive to produce. He will learn several important lessons, among which may be enumerated the following: *First*, fresh butter in November is worth from six to seven cents a pound more than June butter; *Second*, Print butter is worth five cents a pound more than the same butter when solid packed; *Third*, There is a difference of from ten to fifteen cents a pound, between wholesale and retail prices. These are important lessons, and we should all learn to profit by them. We should especially note the opening sentence of this market report —"Market firm and demand good for all desirable table grades." Table butter is what is wanted. Again, "supplies of strictly fancy very small, this class of stock readily brings highest quotations." Here is food for contemplation. Why is it that the supply of strictly fancy table butter continues to be so small? One would think that an art which had been known and practiced for nearly 4,000 years ought to have been brought to a much higher stated perfection. In the days of Abraham, butter is mentioned as one of the articles of food worthy of being set before his angelic visitors; now, but very little of it is considered strictly firstclass and worthy of place upon the tables of our best families.

Why is this so? This brings us to the consideration of some of the principal causes of failure in buttermaking. We will begin first with the cow. Sometimes the cause of failure is in her. There are cows from whose milk a good article of butter cannot be made. To understand this we must examine both the nature and the composition of milk and butter. Milk contains from eighty to ninety per cent. of water, and from ten to twenty per cent. of solids. Average milk contains eighty-eight per cent. of water, and twelve per cent. of solids. The laws of New Jersey and of several other states have established twelve per cent. of solids as a standard of purity for milk. When milk falls below this standard of twelve per cent. of solids by chemical analysis, it is condemned by a State Inspector, and the owner or seller is liable to a fine of $50. We have no legal standard for milk in Pennsylvania. This twelve per cent. of solid matter in milk is usually divided nearly as follows: four per cent. of butter fat, four per cent. of casein, or cheese, and four per cent. of sugar. When the butter and cheese have been extracted in our creameries, the sugar remains in the whey. The whéy, therefore, contains a certain value for feeding purposes. It has been a matter of considerable scientific investigation to ascertain whether the manufacture of sugar from the whey of milk, can be made profitable. This has been attempted in Vermont, and a few years ago there was considerable inquiry made by capitalists from that State to organize a company for the purpose of making sugar from they whey of our Bucks county creameries. I see no reason why the project could not be made a success. We must learn to utilize, to make the most of everything, as they do in France, and indeed in most of the European nations. If whey is worth more for sugarmaking than it is for feeding to stock, that is what should be done with it. In France, when an animal dies, the entire carcass is worked up into something valuable. The hair, the hide, the fat, the flesh and the bones are all turned into money. In this country the dead animal is often dragged into the fields or woods, and there left as food for crows and dogs; or at best, is buried in some hole where its effects as a fertilizer of the soil, can be of but very limited extent.

We come next to the composition of butter. Butter is mainly composed of these fats, viz:—Stearine, oleine and palmatine, with a few flavoring oils, and coloring matter in small quantities. Stearine is described as a hard, white fat, while oleine and palmatine are fluids. Stearine being the only fat that solidifies, its percentage in butter is what makes it solid or otherwise. When butter is deficient in this fat, it is soft and oily. Hence it will be seen, that cows whose milk is deficient in stearine, can never make good solid butter. If it is deficient in those volatile flavoring oils, it will never have that fine aroma. If it is deficient in coloring matter, the butter will be white. He says therefore that one cause of failure in buttermaking, is sometimes in the cow, which no skill of the dairyman can prevent. It is a mistake to devote such cows to butter production.

The next cause of failure is sometimes in the feed. Cows to make good butter, must have good food. Garlic, onions, ragweed, turnips, cabbage, old and musty hay, straw or cornfodder, musty and fermented grains, or ensilage, are not good articles of cow feeds if a first class article of butter is desired. Milk and butter are both powerful absorbents of odores and tastes. In the list of good articles of cow feed I will name apples, pumpkins, sugar beets, (possibly carrots and the yellow globe mangolds, if fed from six to ten hours before milking), and all the sweet scented natural grasses—early cut, sweet hay and corn fodder, wheat-bran and corn-meal. These I regard as pure, wholesome articles of cow feed, from which butter of good quality can be made. Next in importance to pure food, is pure water. The water supply of our dairies is an important matter, and should not be overlooked. The water must be pure, and not too cold in winter. Its temperature should not fall below fifty degrees, which is the temperature of our best springs. The health and condition of the cow is also an important matter. To make good butter we must have pure milk; to have pure milk we must have a healthy cow supplied with pure, wholesome food and drink.

The cow is valuable to the farm for three purposes, namely: First, For the milk she yields; second, for the offspring she bears, and, third, for the value of her body when she is no longer useful for the first and second purposes. In some respects she should be considered as a machine, to be run to its full capacity in order to be profitable. She should be fed all the food she can digest and assimilate, that is not inconsistent with her health and value as a breeder. I am not one of those who think and practice that the cow should be turned into beef after a single season's milking. Our cows, particularly our good ones, are becoming too scarce for that. I have seen cows spoiled for milk production in a single year by too high and injudicious feeding. I have owned one cow that was used up after eight years of persistent and continuous milking; while I still have a cow, now only sixteen years old, that has had fifteen living, single calves, in thirteen and one-half years, and is still milking as well as any cow in the dairy. As long as the cow is valuable as a breeder, and milks well, she should be retained in the dairy. For our present purpose we are now done with the cow, and come next to the care and management of the milk. Here is where the troubles of the buttermaker often begins. Cleanliness is as important a factor in buttermaking, as is Godliness the formation of a perfect Christian character. Its importance cannot be over-estimated, he cannot make pure butter from impure milk, he must have pure milk to begin with. In the old, open-air shallow-pan system of setting milk for cream raising, the difficulties which encountered the dairymen were almost legion. These difficulties have, to a great extent been avoided by the submerged, deep-can low-temperature system. In the shallow-pan open air system, we have the dangers arising from bad odors, too high temperature, and a too hasty decomposition of the milk. The proper temperature, and the depth of setting the milk, bear a corresponding relationship to each other. Milk set four inches deep, in the open air at a temperature not exceeding sixty degrees, may be allowed to stand forty-eight hours before skimming off the cream without injury, *provided*, it has not been allowed to absorb any bad odors. The atmosphere of the milk room must be kept absolutely pure. If it is not, a great mistake has been made. Milk set sixteen to twenty inches deep, in narrow cans, submerged in water of a temperature of forty degrees, will raise more cream in twelve hours, than the same amount of milk set in shallow pans will raise in forty-eight hours at a temperature of sixty degrees; while the dangers from odors are avoided. The dangers of a low temperature are, in letting the milk stand too long before skimming. When souring does not commence in forty-eight hours, there is danger of the cream becoming bitter. Another species of decomposition will set in, which is equally, perhaps more fatal than fermentation. I am not an advocate of churning sweet cream. It takes too long to churn—it produces less butter, I think the practice of the best buttermakers is to slightly sour, or ripen the cream before churning. It makes more and better butter, besides being more easily churned. The question of churning is an important one. In this operation the matter of temperature is all important. We have two kinds of churns, and two methods of churning:—one by friction, and one by concussion. The former is the old fashioned, the latter the more modern. In churning by concussion it is more important to have the temperature right, than it is in churning by friction. If the cream is too cold, the butter will be long in breaking, and still longer in gathering. The granules of butter, being cold, are hard, and will not adhere together. Butter is often spoiled in the churning. If the cream is too warm, the butter comes too quickly—is soft and oily, and will never make a first class article. The proper temperature for churning I regard as ranging from fifty-five degrees to sixty degrees in summer, and from sixty to sixty-five degrees in winter. In summer the cream is apt to grow too warm as the churning proceeds, while in winter it is likely to grow too cold. The operation of churning should not take more than twenty or thirty minutes. When a longer time is required there is something wrong. The chief cause of this difficulty is in not churning at the proper temperature.

Almost every week we read inquiries in our agricultural papers—

"why don't the butter come?" and the poor dairyman doubtless often sighs as he churns, "Oh, if Elizabeth were but here." I have been in this situation and know what it is.

When the churning is done, the butter should be well washed, or worked, salted by weight and not by guess, at the rate of from half an ounce to an ounce to the pound, according to the tastes of customers, and printed in some neat, attractive style that will adorn the table and please the eye as well as the palate. There is more in the preparation of an article for market than is generally supposed. An article well prepared is already more half sold. Buyers will pay for appearance, even if the quality is no better. This applies to dairy products, as well as to fruits, vegetables, or any other product the farmer produces for sale.

The question is often asked, "what shall we do with the product of our dairies?" The answer to this question depends upon several considerations. If the milk can be sold at eight, six, or even five cents a quart, that is the best thing that can be done with it. It is not worth that for making butter, or cheese, or feeding to stock. Selling the cream at twenty-five, twenty, or even sixteen cents a quart is a good business, and should be done, wherever the opportunity is offered. The skimmed milk contains all the cheese and sugar, and is really worth two-thirds as much as the whole milk as an article of food. Sending milk to our large cities at three cents a quart in summer, and four cents in winter, is generally considered to be more profitable than buttermaking. This can be done, and is done, by a very large proportion of dairymen. Selling milk to the creameries, where the average yearly price paid for milk is about one dollar per hundred pounds, or two cents a quart liquid measure, is not a very lucrative business. And yet our dairymen even in this way realize from fifty to seventy-five dollars for the product of each cow, according as she yields from 5 000 to 7,500 pounds of milk in a year. A cow that will not yield 5,000 pounds of milk in a year should not be retained in the dairy; she will not give a profit to her owner.

The dairyman should set a high standard for his cows, and strive to reach the mark as nearly as possible. One hundred dollars a year is not too high a standard. I know dairymen who reached this mark, and some have exceeded it. Three hundred pounds of butter at thirty-five cents a pound, brings $105, and 10,000 pounds of milk at one dollar per 100 pounds, brings $100. The products of the dairy are not confined to the selling of the milk, or the making of butter alone; a great variety of other wholesome and palatable food products can be prepared for sale. The entire product of the dairy should be utilized. A mixed system of dairying, so to speak, should be pursued, as well as a rotation of crops, or a diversified production by the general farmer and agriculturist. Perhaps I can make this idea more plain by giving a brief outline of how I manage the dairy.

First.—I live within two miles of two towns, one containing a population of 4,000, and the other of 1,000 inhabitants; and thirty miles from Philadelphia, and about sixty miles from New York markets.

Second.—I keep a herd of thorough bred registered Jersey cattle, whose milk will yield twenty-five per cent. of cream, and make six pounds of butter to the 100 pounds of milk. I sell all the new milk I can at seven cents a quart in summer, and nine cents a quart in winter. These prices are one cent a quart higher than those obtained by the regular milkmen, from native cows, and are due to the superior quality of the milk and cream. The milk is strained into quart glass cans, and placed in cold water for twelve hours before being sold. Each quart of milk thus treated will produce half a pint of cream, twenty-five per cent. I go to market twice a week, Wednesdays and Saturdays mornings. Each day before market all the milk is set in the deep can system in cold water, temperature ranging from 45 to 50 degrees. This skimmed each market morning, and both the cream and the skimmed milk taken to market. The prices for cream are twenty cents a quart in summer, and twenty-four cents in winter. The prices for skimmed milk are three cents a quart in summer and four cents in winter.

All of this is better business than making butter, even if fifty cents a pound could be obtained, and is to be encouraged. The remaining days of the week the milk is set for buttermaking. The butter is sold mainly to customers living in those two towns, and the balance sent by express to New York. The prices obtained for butter, are thirty cents a pound in summer and forty cents in winter, averaging about thirty-five cents a pound for the year. This is better than sending milk to the creameries at the prices paid by them for it. The buttermilk is sold at three cents a quart. The skimmed milk that is not sold while sweet, is allowed to sour and thicken. It is then made into curd or cheese. In this way it is worked up and sold in three distinct forms: First as dry curd, at eight cents a quart; second, mixed with cream and sold as cottage cheese at fifteen cents a quart; and third made into balls of about a pint each, and sold at five cents a piece. This may not be the best way to manage the dairy, but it is a way by which my cows are worth $100 a piece to me in a year. There are no doubt many others who can make a better showing than this; but is far above the average.

Secretary Edge has requested that I give some statistics of the way some of our farmers manage their dairies. I can give none but my own. I should hesitate to do this, were it not for the fact that I never published a dairy statement of my own, but what some one of our Bucks county dairymen would come out with one far exceeding it. I have said that the milk product of a cow should be worth $100 in a year or $8⅓ per month.

My dairy consists of twelve cows and the following is the record for the months of April and May in 1888:

April.

Butter, 205 pounds at 35 cents per pound,	$71 75
Skimmed milk, 676 quarts at 4 cents per quart,	27 04
Buttermilk, 154 quarts at 3 cents per quart,	4 62
New milk, 30 quarts at 9 cents per quart,	2 70
Cream, 24 quarts at 24 cents per quart,	5 77
Cottage cheese, 60 quarts at 15 cents per quart,	9 00
Total,	$120 87

An average of $10.07 per cow for the month. The prices for April are winter prices.

Product for May, 1888.

Butter, 301 pounds at 30 cents per pound,	$105 35
Skimmed milk, 736 quarts at 3 cents per quart,	22 18
Buttermilk, 121 quarts at 3 cents per quart,	3 63

New milk, 36 quarts at 7 cents per quart, ...	$2 52
Cream, 26 quarts at 20 cents per quart, ...	5 20
Cottage cheese, 88 quarts at 15 cents per quart, ...	13 20
Total, ...	$152 08

Being an average of $12.67 per cow for the month. The prices for May are summer prices.

The Creamery System.—About thirty years ago a great revolution was inaugurated in dairying by the introduction of the creamery system, or associated dairying. The advantages of this system consist mainly in raising the standard of quality of butter, and in removing the labor of butter and cheese making from the farm to the factory, thereby lightening the labors of many an overworked farmer's wife. The profits of this system are not equal to those of the first-class dairymen who are so fortunately located as to have a good retail family custom; but is much better than to send to the distant city, pay freight, sell at wholesale prices and pay commissions. These take all the profits, and all the heart away from the dairyman. The creamery makes a uniformly better article of butter than the average farmer, and it commands a better price accordingly.

A great part of this improvement in quality is due to the improved machinery used, and the superior knowledge of the creameryman. The quantity produced from a given amount of milk has also been increased, as well as the quality improved, which also adds to the profits. By the use of the centrifugal machine, the average amount of butter made from 100 pounds of milk, has been raised at least half a pound. Formerly from three and a half to four pounds of butter from 100 pounds of milk was all that was obtained; but now they have no difficulty in obtaining four and four and a half pounds. There is also great economy in marketing the product. The superintendent, can sell the entire product of the creamery to a better advantage than can the fifty or one hundred patrons. In creamery management there are two plans adopted; one being in purchasing the whole milk, the other in purchasing only the cream. The creameries in the south-eastern counties of the State, so far as I am aware, adopt the former course; while our northern and middle counties have adopted the cream-gathering plan. It may be that each method has its advantages, but a recent inspection of the cream gathering have inclined me to give it the preference for the following reasons:

First.—The farmer sells only his cream, retaining the skimmed milk at home for his own use.

Second.—The price paid for the cream is in exact proportion to the amount of butter it contains, which is but an act of simple justice.

Third.—This everlasting running to the creamery every morning is entirely avoided. In our section of the country the entire community is stirred every morning to go to the creamery, no matter what may be the conditions of the roads or the weather. By the cream-gathering plan, wagons are sent out twice a week, early in the morning, which scour the country for miles around, coming in laden with cream in the evening. The cream is bought by the inch, which represents either quarts or pounds as you like. The measuring can is twelve inches in diameter, and in inch of cream in it, represents about two quarts or four pounds of cream.

When the cream is gathered it is thoroughly stirred and a small sample taken in a glass tube from each lot purchased. These samples of cream are churned on an oil test churn, and the butter melted, and the percentage of oil accurately measured by a graduated scale. I have seen samples of cream tested by this method from three pounds to thirteen pounds of butter from the same quantities of cream. The price paid for the cream is what it will make on butter, the price of the butter varying with the season and locality. For example, suppose the price of butter is twenty-five cents a pound, and that farmer A.'s lot of cream makes three pounds of butter, and farmer B.'s lot of the same amount of inches, or quarts, or pounds, makes thirteen pounds of butter. Farmer A. gets three times twenty-five cents or seventy-five cents for his cream, and Farmer B. get thirteen times twenty-five cents or $3.25 for his cream, both amounts being equal. This is nothing more than fair, but Farmer A. is of course dissatisfied, he curses the creamery, and says it is no good, while Farmer B. is satisfied and says it is all right.

The practice of paying a uniform price per pound or quart for all milk, regardless of quality I unhesitatingly condemn as unfair and unjust. So long as our creameries continue to pursue this method, they are offering a direct premium upon dishonesty. The farmer is stimulated to produce the greatest number of pounds or quarts of milk regardless of the quality entirely. He will purchase his cows with this sole object in view; he will feed his cows with this object in view alone, even if he does nothing worse. When milk is bought and paid for on proportion to its value in butter, then, and not until then, will exact justice be meted out to all creamery patrons owning herds of different breeds, and pursuing different methods of feeding their cows.

I will close this paper by giving a few

Creamery Statistics.—Previous to 1880 dairying in Bucks county was confined to the farms where the cows are kept. Since that time our farmers have rapidly gone into the creamery system. Two years ago we had thirty-five creameries in operation; more than any county in the State. The growth we have made from creameries in 1880 to thirty-five in 1885, is most extraordinary. This method of dairying, however, in common with all other methods, has yearly grown less and less remunerative. The statistics of one of my nearest creameries show how gradual and constant this decline has been. Paid for milk in 1882, $1.30 per one hundred pounds; in 1883, $1.29; in 1884, $1.17, in 1885, $1.04. Received for butter, 1882, thirty-seven cents per pound; in 1883, thirty-two cents; in 1884, thirty cents; in 1885, twenty-seven and a-half cents. Here we see that in four years the price of butter has fallen from thirty-seven to twenty-seven and-half cents per pound; causing a corresponding decline in the prices paid to patrons for their milk from $1.30 to $1.04 per one hundred pounds. The outlook two years ago was not encouraging, and many farmers were seriously considering whether to continue the keeping of cows. For the information of those not familiar with the creamy system, the following statement of one year's operations is given. It is for the year 1885. Quantity of milk received, 2,629,920 pounds. Highest price paid, $1.40 per one hundred pounds. Lowest price paid, 80 cents, and the average price, $1.04 per one hundred pounds. Whole amount paid for milk during the year, $26,243.62 cents. Received for butter sold, $28,569.25 cents. For cheese sold, $998.63 cents, and for skimmed milk sold, $1,742.13 cents. Making the total receipts for milk, cheese and butter, $31,320. The difference between the receipts, and the amount paid for milk, shows a balance of $5,076.39 cents. This sum represents the amount paid for labor, running expenses, and the dividends paid to stockholders.

The low price of cheese, which was skimmed milk cheese, induced the managers to resort to selling the skimmed milk to patrons and others for family use, for feeding to calves and pigs, so that the receipts from this source exceeded the amount received from the sale of cheese. The quantity of milk required to make a pound of butter was twenty-five pounds.

Profits in Creamery Dairying.—When John I. Carter of Chatham Creamery, Chester county, was asked to give the profits of the creamery, he replied : "We pay three and a-half cents a quart for milk, nine quarts of milk makes a pound of butter. We get forty cents a pound for butter; make your own calculations." The result of this is the milk for a pound of butter costs thirty-one and-a-half cents, leaving eight and a-half cents to pay for labor and profit. These were prices in January, 1886. Let us see how this works when applied to our own Bucks county creamery in 1885. Price paid for milk $1.04 per one hundred pounds. Quantity of butter made per one hundred pounds of milk was four pounds. Price received for butter twenty-seven and a-half cents per pound, and $1.10 for four pounds. In this case the profit on four pounds of butter is six cents. In neither of these calculations is the value of the skimmed milk estimated, either for cheese-making or for feeding purposes.

It therefore remains after all, for every farmer to determine for himself, according to his location, what method of dairying he will pursue, either for pleasure or for profit.

As to the quality of the butter made at our creameries, compared with dairy butter, I would say there is no doubt but the average quality has been raised. It is more uniform and of a higher average quality; but it is not equal to that made in our best dairies. The reason for these differences are plain. First, the creamery must take the milk of from fifty to one hundred farms, and there are that many more risks to run that unclean or impure milk will be delivered, increasing the liability of damaging the entire product. There is not so much to be guarded against in the individual dairy.

Management of cows.—Your programme says I am to say something upon the management of dairy cows. The cow is the dairyman's best friend. Therefore she should be fed liberally, treated humanely, and milked regularly and thoroughly. I have already alluded to the feeding and watering of dairy stock. Bad and inhuman treatment of any kind will cut off the yield of milk so effectually as stinting the supply of food. Harris Lewis says "the brutal man has no place in the dairy." The cow is an animal that suffers from extremes of heat and cold, and both tell upon the yield of milk. The stable should be kept so warm in winter that water will not freeze in it; and a shady resort in summer from the heat of the day will prove a great advantage. The cow should be milked out clean every time; get the last drop, for that is the richest.

Dairy Breeds.—A few words upon dairy breeds. Each breed of cattle has its merits, and particular advocates. Without desiring or intending to disparage any of the various breeds of cattle for dairy purposes, I propose to say a few words in defence of the much abused Jersey cow.

The total amount of milk solids required by law in some of our States where a standard has been established is twelve per cent. In some samples of milk analyzed from my own herd of Jersey cows, the chemist reported sixteen and seventeen per cent. of solids. The average yield of butter-fat in milk from common cows was found by our creamery to be four per cent. In my own herd it will average six per cent. In the recorded tests of some of our best Jersey cows it has reached as high as nine and ten per cent., but these cows had been fed and trained for special butter production. It may be said these are exceptions. Let us see. In 1884 Major Campbell Brown, of Tennessee, compiled and published a book containing the recorded tests of Jersey cows that had made fourteen pounds of butter and upwards in seven days. In this volume I find recorded the names and butter yields of 448 Jersey cows. Of this number twenty-three cows have recorded yields of twenty pounds of butter in seven days, and of this number six cows have recorded yields of from twenty-four to twenty-seven pounds and ten ounces of butter in seven days. The names and butter yields of these cows are worth presenting, and I give them as follows:

1. Princess Second,	27 lbs. 10 ozs. of butter in 7 days.
2. Mary Anne of St. Lambert,	27 lbs. 9¼ ozs. of butter in 7 days.
3. Nancy Lee,	26 lbs. 8½ ozs. of butter in 7 days.
4. Jersey Belle of Scituate,	25 lbs. 3 ozs. of butter in 7 days.
5. Value Second,	25 lbs. 2$\frac{11}{12}$ ozs. of butter in 7 days.
6. Hazen's Bess,	24 lbs. 11 ozs. of butter in 7 days.

But this is not all, Major Brown has since collected sufficient material and has now published a second volume of as many more Jersey cows having recorded yields by authorized tests of fourteen pounds of butter and over in seven days. No Jersey cow is admitted to this book unless she will make at least ten pounds of butter a day, and we have in these two volumes from 900 to 1,000 cows with such records. When any other breed of dairy cattle can show such record, then, and not until then, will it be necessary to say anything more in defense of the Jersey cow.

Extraordinary Yields.—There is a recorded, authorized official test of Princess Second having made over forty-six pounds of butter in seven days, being over six pounds of butter a day. This is so remarkable and extraordinary that it has had the effect of producing doubt and disbelief in many minds. I can account for it in this way. A new discovery has been made, by which it is claimed that fifty pounds of butter can be made from one hundred pounds of milk. The secret of this is that by treating the milk chemically, and churning, the total amount of milk solids can be separated from the water, and combined in one mass and called butter. This we have shown to range from twelve to twenty per cent. Pure butter should analyze from eighty-five to ninety per cent. fat and from ten to fifteen per cent. of water; but Prof. George H. Cook, of the New Jersey experiment station wrote to me that he had analyzed samples of so called butter, containing forty per cent. of water. If now we take the total milk solids say twelve to sixteen per cent. and forty per cent. water, it is very easy to see how milk can be made to produce fifty per cent. of butter.

Dairy Buildings.—A few years ago when the question of deep or shallow setting was being discussed pro and con; a perfect dairy house was considered to be the one great thing needful. Many plans were drawn and published, and some patents applied for. It was considered very desirable to so construct the dairy room that a uniform temperature not exceeding sixty degrees could at all times be maintained, no matter how hot the weather became. It was with this object in view that in the summer of 1873 I visited the then celebrated dairy houses at Ogden farm, at Newport, Rhode Island, and Beacon farm, at Northport, Long Island. After returning home I constructed one of my own, combined with an ice house, employing ice to cool the dairy room by a reversion of the principle of heating a room, viz: by placing the ice stove in the ceiling of the room to be cooled, just as you place the stove near the floor of the room to be warmed.

This building has proved a success and given satisfaction as the accompanying descriptive circular and testimonials will show. These dairy houses where mainly valuable where the open, pure cold-air system of setting milk was pursued.

They are now superseded to a great extent by the introduction of the various kinds of cabinet family creamers.

Dairy Legislation.—During the last ten years legitimate dairying has had to contend against a dishonest, unfair and illegal competition. For some time regulatory laws were passed requiring the counterfeit article to be branded and sold under its own distinctive name, and not under the name of butter. These laws not proving effectual, prohibitory legislation was resorted to. The prohibiting law passed by our Legislature two years ago has stood the test, both in court of Dauphin county and in the Supreme Court of the State. The latest decision of our Supreme Court shows the matter in its proper light. The suit being "The Commonwealth against Harry Walker and other manufacturers of oleomargarine, was decided at the present term of the Supreme Court of Pennsylvania, at Pittsburgh, in favor of the Commonwealth. The court says, "We were of the opinion in the case of Powell against the Commonwealth, *as we are now*, that the Legislature has the power to prohibit the manufacture and sale of an article detrimental to the public health. Whether oleomargarine was such an article was a question of fact, and one which had been determined by the Legislature. We are bound to presume that it was done upon sufficient evidence. The question now presented by the defendants was not strictly made in the court below, upon the trial of Powell *vs.* The Commonwealth, and was not pressed upon our attention. We affirm this case *pro forma*, in order that both cases may go to the United States Supreme Court together." And here is where the matter now stands. The dairy industry, as well as the whole country, has been benefited by the law, and all classes should unite for its support.

GRADING DAIRY STOCK.

By W. P. HAZARD, Esq., *West Chester, Pa.*

(An address at the Lock Haven Institute.)

MR. PRESIDENT: Grading stock until the past few years, and even in many parts of our country at present, has been and is carried on without any system. The farmer carelessly, and with an eye, as he thinks, to economy, pursues his home-made breeding if it is worthy of that title, in a very slip-shod manner. With the majority, the idea is simply to have his cows got with calf that he may keep them milking; and so he buys the cheapest bull he can find; he then either deacons the calves or raises them a few weeks and sells them to the butcher or calf dealer. This is the crudest form of breeding; he raises no cows, he does not elevate the tone of his herd; he relies upon the village inn sales for replenishing his stock, and thus shirks much care; takes but little care of his stock, and usually has a mortgage on his farm. Blessed is such a man that he does not perpetuate such stock, but that it all quickly finds its way to shambles, and the toothsome bologna.

The next grade of farmer, when he occasionally secures an extra milker, concludes he will raise her heifer calf, and he does; but as he was unwilling to invest an additional ten dollars in a better bull, is surprised to find after his calf has come to maturity, that it is not nearly as good as the mother. After trying this style of breeding several times, he gives it up in disgust and pursues the old plan of buying all at the sales.

We will now take a higher grade of farmer, for there are grades in farmers as well as in their stock, and we will find him buying and paying an extra price at the sales, for stock that has a touch of "Alderny" in it as he will persist in calling "Jersey" blood. He gets, of course, a better cow for the better price invested and that will give a steadier and more continuous flow, and richer milk. Directly the idea strikes him why should he always go to the sales and pay the extra price there on every such cow he buys, when if he put that extra price only once on a good bull, he could select his best animals for breeders, and he could follow this up just a little deeper and inbreed for a few times, and bring his stock up to a high grade of fifteen-sixteenths, or even thirty-thirthy-seconds. He has read *The Country Gentleman*, he has heard of the records of the thoroughbreds, he has even encouraged them by paying an extra price for his grades, and in fact, sometimes he even advances so far as to imbibe the idea that it would be as cheap for him to raise thoroughbreds and derive a profit from the sale of his pure calves as to get it only from milk and butter products.

Just as the farmer advances in these upper grades of breeding, just so will his farm and his buildings speak as eloquently of his progress in intelligence and thrift, so that he who runs may read by the outward appearance of the farm, as well as of the stock, just where the owner stands. His superior attention to breeding brings him ampler returns, and his pleasure is increased in many ways as well as his profits. To be a creator is to enjoy a pleasure, growing by what it feeds on; for to watch the development of what the mind, the divine part of man, has arranged, created and systematized, brings the highest reward which the exercise of the highest powers demands.

To grade is to do what? Worcester defines grade,—rank, degree, step; it is from the Latin—gradus; from the Anglo-saxon—grad. All the compounds of this word, as gradual, gradient, graduate, gradation, etc, express the same meaning. That is, that by degrees, by steps, whether up or down, a progress is made, an object aimed at is accomplished. It also conveys an idea of time, for whether the steps are fast or gradual, it takes time to reach the goal desired. We may reach a higher or lower grade just as the railroad aims to do; the grade is not always up, it may be a down grade, just as a man who uses a scrub bull on his stock will surely pursue a downward grade.

The term crossing is also often applied. Cross is from the Latin, crux, the emblem of christianity. As applied to cattle, it means to breed by the union of different races. Thus while it has a peculiar signification, the terms crossing and grading may be used interchangeably without violating much propriety of expression. For while grading, up or down, may be accomplished by bringing the good and bad together of the same breed, as is usually considered; it is done thus for the purpose of improving a breed, of which the short-horn may be cited as a brilliant specimen; yet, on the other hand, crossing of one breed upon another is usually done to grade the one breed up to the higher grade of the other, or to form another breed. This has been done, notably in sheep, swine, bovines, dogs, poultry, etc., and with great advantage, and new breeds have been created. Where it has been attempted to create new races, or species, such attempts have signally failed, and certain points have been reached, and perpetuation of such have not been successful, as the mule for a familiar instance.

These new breeds were carefully improved from the low grade of the first cross, for a long succession of years, until nearly perfection has been attained, become so fixed in habit and certain points, that they are able to hand down those fixed characteristics and to engraft them upon an inferior stock. The result of such union is an up and down grade, the superior having been reduced from its higher level and the inferior has been raised from its lower level; and still the result is a grade. Now that grade is better fitted to be advanced to a higher grade than is its inferior parent; because that grade has to a certain extent, become imbued with a portion of the strong points of the breed of fixed type, and these points, or modifications of the inferior animal, are better prepared to receive an accession of similar good points, because like assimilates to like, and there is less resistance from inferior points which have already been partly overcome. And this gives us two cogent reasons why only the best should be used of the superior breed; first, because the better, that is to say the more potent, or more fixed in type the superior is, the more power will it have to overcome the points of the inferior; and, second, having more good points than usual, and meeting with less resistance, it will the more readily and the more permanently fix a larger number of good points.

This again leads to another point of the argument, that we shall meet with more and readier success where we cross our breeds, having the greatest number of similar points or characteristics. For instance, if we take the so-called native, which owes so much generally of its creation to the Durham, and cross upon it a pure Short-horn of a pronounced milk strain of that breed, the result would most probably be a very superior milker, increasing the yield over that of its dam perhaps thirty-three to fifty per cent., at least after one or two crosses. So also using a Freisian bull from pronounced large yielders, upon a pure Short-horn of one of the milking strains, one may readily expect a large milker, for in both the supposed cases above, it would be bringing together again animals of original type, after many out-crosses, and they would assimilate together as meeting with less tendencies to opposition from varying types.

But cross the little Jersey upon the Freisian, and the result would be not an increased yield of milk, but the Freisian size would be reduced, while the milk would be more enriched, but reduced in quantity. And yet, this milk would not be enriched as much as would that of the Ayrshire if crossed by the Jersey; because the Ayrshire already has or had Jersey blood in her. Thus there would be less opposition of elements in the latter than in the former; and all the less so if the Jersey was of a most pronounced type of richness; for it cannot be gainsaid that the normal condition of some animals is much more inclined to throwing off far more fat or butyraceous particles than others. This may be proved by taking half a dozen animals standing in adjoining stalls, feeding them all alike, and testing separately their butter yields. Then upon a given day commence feeding all of them fat-producing foods, and continue that for a month, then test their yields. It will be found that some make ample returns for the extra butter-producing feed; others will very moderately increase the amount, while others will vary their normal condition not at all, or not in proportion to the increased feed. This proves that unless the normal condition is capable of converting the food into fatty substances, it is not profitable to feed beyond a certain amount; that all beyond that amount is waste. Mary Ann, of St. Lamberts, consumed fifty quarts of feed; whether she profitably consumed all over thirty-five quarts, or whether she could have profitably converted sixty-quarts, is not known, and would depend entirely upon what her normal capabilities are.

The usual mode of breeding grades is to get a bull of the breed which we want represented in our herd. This is not, as many suppose, because the bull is the most potent factor, or that he contributes more to the calves than the mother. The share of each upon the fœtus is about the same; perhaps varied only by one being more lusty at the time of conception than the other. But we use the bull of the breed desired because the herd is of varied percentage, and one bull does for many. It is important then that the bull should be well formed so that he will get shapely calves; vigorous, that he will be potent enough to impress his get; and pure-bred so that he shall inherit the traits distinctive of the breed. For if himself a grade no one can rely upon his product, for the principle of atavism is so strong that hidden traits, or faults that may have lain dormant for several generations, may crop out and do harm. So with this danger that the weak side may show, inherited from a mongrel ancestry on one side, it is not safe to breed from a grade bull. Let the rule always be to get a pure-bred animal, and as good as the breeder's means will allow. There is no excuse at the present day for any breeder doing otherwise, as the opportunities are frequent for obtaining pure-bred as cheap as those of unknown parentage can be had. Take such a community as this, where the very best bulls can be had for fifty dollars or less, no one need breed from a poor bull. At any rate for fifty dollars, there can be had the best of all breeds for making grades of high character from natives, I mean the Guernsey.

I have no patience with any one who tells me that he can't afford a pure-bred bull, when I know the facts are otherwise. Frequently bull calves can be had from ten dollars upwards; yearlings from thirty dollars upwards. And it is incomprehensible why farmers will pass by such animals and go to the village sale and pay twenty-five to forty dollars for a scrub of unknown parentage. Even if they want to sell the calves at a few weeks old, a good Guernsey grade will or should bring a better price than one of common stock, for the veal will be fatter and more tender, and grows as fast.

Perhaps there is no living proof greater than the general purpose cow, of the vanity and emptiness of ordinary breeding. Here is an animal that drags along its existence, giving a moderate yield of milk and a smaller proportion of butter, eating her fullest share of the food that is going, taking care of herself more than of her masters; all of which pleases his eye, for inwardly he has his mind upon one main object, that she will readily fatten and sell well for beef eventually. Finally, he decides it is time to sell her, and he has to accept bologna price or the price of old cow beef. The cow of the Channel Island's breeds has all along been far more than paying her way, making a great deal more butter on less feed each year of her life, and when she is butchered the farmer finds a fatter, more juicy and a tenderer animal than he had any conception of. Because she kept thin while she was doing so much work has been no proof that when you have succeeded in drying her off, her extraordinary richness is not being absorbed by herself in a tasty product of beef. Better, yea, far better, could the farmer bury her instead of eating her, and she would yet have been the more profitable one than the one that has been kept, because she would sell for beef. The rich cow has earned far more than the cost of her carcass beyond what the general-purpose cow will bring.

There are many theories about breeding, and many facts seem to often warrant them; and yet also the exceptions are so numerous that the theories dissipate into thin air. But a long course of careful observations have generated certain principles which it is as well to bear in mind.

If the sire mainly gives the shape and configuration, and forms the outward frame; and also where he is from a strongly marked race in color, like the Devon, if he gives the color to his get, then it would be well in selecting such sire, to have one most likely to give us the best form and color. Therefore, the choice of the bull should be satisfied only with one as near perfection in form, and just in proportion as possible. Some would say, then let us choose a bull with feminine head, of fine bone and of a delicate form, and some do so choose. But we differ from them, and this difference is one proof that the theory that the young animal derives all its exterior form and motion from the sire does not hold entirely and always true. The bull should be distinctly masculine, and the cow decidedly feminine; but both, while maintaining their distinct type, should be of a refined type. Manly beauty and womanly beauty are distinct, and where each is the most perfect, we have a right to expect the most perfect result, and that in a refined form.

On the other hand, when the same theory is carried out to the female, it is often popularly supposed that the female contributes more to the vital organs, to the internal structure, to the nervous organism, which excites the temper or controls the constitution and ability to stand any strain upon the system. Neither can we believe this theory to be always true. Much will depend upon the state of health of both parents, and thus the vigor of each. If both are in prime health and condition, then we believe both the external and internal structures are mutually modified by the vigor of each parent. But as it is important the cow shall be in fine health, so it is important she shall be in fine form; in short, she shall have what is the first and greatest requisite in selecting breeders, a good constitution. This will give the large, deep barrel, so that the organs of digestion shall not be crowded by the fœtus, and deep pelvic structure so that the fœtus may have ample room for development and for safe and easy birth.

One other point which helps the theories we have mentioned is that very generally the diseases of the vital organs are more likely to come from the female, while diseases of the joints are more likely to be from the male.

There is no doubt, and facts have been adduced in several articles lately in the *Guernsey Breeders' Journal*, in support of another theory, and that is, owing to some inscrutable delicacy of structure of the female, or of great vigor of the male, namely, that the influence of the male, especially of the male of the first conception, lingers and acts long after the birth of the first fœtus, and makes its mark of influence on after births. These are subtleties past our finding out the cause, but they act as warnings to us to be careful to breed from only pure-bred males; for breeding from scrub bulls or even grade bulls, we know not what deformities or bad influences are to act upon future conceptions; and I repeat the only safe practice is to use first, last, and all the time, pure-bred bulls in making grades; and the purer the bull in his breed, that is of most characteristic type, the more potential he will be in transmitting the desired types. and the more power he will have on his mate if she is pure-bred too.

To improve the dairy results, it is very important while using him on your best selected cows, that he too shall be of dairy appearance. His hide should be very mellow, and the hair short and soft, and his color of cuticle, golden. These will be caused by the butyraceous nature he has inherited, therefore, a bull selected from a known milking ancestry would be most likely to inherit the tendencies strongly enough to impart it. Another desirable point for him to have is what are vulgarly called milk-veins, though the transmitters of blood back to the heart; these, with four well developed teats, are a great addition to his value. The close student of the escutcheon will find the more he intelligently observes it, the more likely the fuller and broader; the more perfect and even it is, the more likely he will find the greatest number of the best points accompanying it. Then if it is desired to obtain a good escutcheon on your milking stock, your bull must have it, for as from nothing, nothing comes, he cannot impart it unless he has it. Few bulls, that to the critical eye are first-rate in all points, will be found without a good escutcheon.

It will not do to select the bull because he is handsome, or of elegant figure; as well might we select the dude for our type of man, or for his ability of intellect, as to select the bull for his beauty of appearance instead of his dairy qualities or inheritance. The best bulls have been the ugliest, as Rioter 2d, Signal, Albert and others; but they were well built and vigorous, and were well bred from dairy stock. The bull that comes from dairy inheritance on both sides, is the one best to be relied upon, not from the phenomenal animal, who is an exception to her ancestors, but we believe several of the phenomenal cows have led to a closer inspection of their ancestry and not been found wanting.

The aim, too, should be to cross the stronger animal on the weaker, in order to improve the constitution of the result. That this can be done is proven by the immunity from disease which cross-bred animals have, where the thorough breds are not free from them. There is no doubt that many of the pure-breds suffer from many diseases which are prevalent, but from which the grades are free. Whether it is in the one case from too much in-breeding of the same types, while in the other case the crossing or out-breeding brings in new blood, we can only state our surmises and belief. Frequently we hear of grades doing more and better work than their ancestors on either side have done;

surely this must be from more vitality or vigor from the infusion of new blood. Nor need the breeder fear his grades inheriting any tendency to certain diseases from the pure-bred side. All this seems to be corrected by the mixing of bloods.

No farmer should be satisfied unless, according to the size of his herd, he is rearing from three to five grade calves every year. The average cost of raising a yearling, as reported by hundreds of correspondents of the State Board of Pennsylvania, and from every county in the State, was $11.10, and of the half-dozen counties, including Chester, Delaware, Montgomery, Bucks, Berks and Philadelphia, where feed is higher than anywhere in the State, the average for a yearling was $13, and for one two years old, $24.50, and the average of the whole State was $20. Now as the heifer may be allowed to drop her first calf at two years old, her calf would be worth at least $10. Thus any farmer can see how he is letting the bung-hole open while he is playing with the spigot. An animal that he can raise for from $10 to $15, he will go to the sales and give from $50 to $60 for and know nothing about its parentage, while if he raised it at home out of his best cow and from a selected bull, he would know all about it.

Not only by raising his own stock will he get it at a nominal cost, and one, too, that he will never feel, but he will get a vastly better herd than he could buy at any price; first by raising his calves from his best cows, but by a little allowable in-breeding, he will bring his stock up to three-fourths and seven-eighths pure in a very short time. This process too fixes and enlarges the good qualities which his bull and his best cows possess. But he must start right, that is with good animals, for he must not flatter himself that by breeding he is going to seat permanently only the good qualities which he wants or knows his animals to possess. He must remember the bad traits, like sin, are as deeply rooted as the good traits, and he must breed from those that have the fewest of them.

The old adage of "like produces like" made breeders careful to "breed from the best," and from the winner in that small circle of "the best." But the mysteries of breeding, often confront the breeder with an animal that is certainly not of the best, whether it is from some bad and perhaps unknown trait from ancestors on either side reappearing, or because the conjunction of the two parents was not a happy "nick," no one can tell. But these slips have occurred often enough, in every breeder's experience, to make him believe in the truth of another maxim, "there is a black sheep in every flock." These should not discourage him, but only make him search into his breeding all the closer, to discover where the fault can be corrected.

He should breed for constitution; for beauty of form, not mere beauty, but that form which is "handsome is that handsome does"—that yields: for beef, if for a beef breed: for milk and butter if for the dairy; all these must be subsidiary to profit derived from lowest cost of feed. Perfection of form for the purpose wished will bring most generally the best results at the lowest cost. This idea must be settled in his mind, and he must constantly breed up to this settled form; not to see how little his animals will eat, but to have them yield the biggest returns for the amount eaten. Mary Ann is a striking example; no cow was ever reported to have eaten as much as she did during her test, but no cow has ever been reported to have yielded as much for a continuous period; and therefore she, though the biggest eater, was the largest producer, and which results reduced the cost of her products, besides requiring the care for but one cow, while it would have required that for three cows. So long as there was a profit in her yield beyond the cost of her keeping, and this was in proportion to the amount of her yield, then she is a profitable cow, and a more profitable one than she that eats less and yields less. This is the point that the breeder must strive for, to feed as much as he can, so long as the proportion of profit has been maintained. Thus the cow that yields 500 pounds per annum is more profitable than the cow that yields only 300 pounds, even though she may eat forty per cent. more of food than the poorer yielder, for the care of ten cows of either yield will be the same nearly, yet the yield of manure and other savings of expenses will make the 500 pounder the most desirable, as the practical man will soon find, and his returns will be in the receipts from a costly and condensed product, while his expenditures will be for a bulky and less costly material.

The object to be gained that I have but hinted at in the time you have given me your attention, can be secured only by two means—selection and grading. Both carefully followed are the surest means of improving the herd up to the highest standard. The rules for selection you will find in our "How to Select Cows." With a good foundation by the process of critical and intelligent selection, a superstructure may be raised by grading with pure-bred bulls up to so high a standard that the yield may be phenomenal, the pride of the owner may be indulged, a pattern be set, and a large profit be reached.

BREED SUPERIOR TO FEED.

By WM. FAIRWEATHER, *Meadville, Pa.*

The dairy interests of this country are on the increase, and have within the last dozen years assumed vast proportions.

This is an age of specialties and the intelligent farmer is working out of the old ruts that trammeled him and striking out in the paths of advancement and science. He no longer bends his back under a big beef cow when he is selling his milk to the cheese factory, nor does he saddle a fifteen hundred pound Clydesdale when he goes for the doctor. There is no place for a general purpose cow in the dairy. When the dairyman wants milk he wants it produced at the smallest possible cost, and cannot afford to feed an unprofitable carcass. What he wants is a cow that will yield the greatest quantity of milk and butter on the smallest quantity of feed. Where is he to find such a cow; or how is she to be produced? Is she to be the production of special breed, or is she to be the result of special feed? This subject has been receiving special attention of late by scientific dairymen. Professor Alvord says, after a careful test by analysis, that there is a far greater difference in the milk of distinct breeds of cows than of cows of the same breed. Dr. Sturtevant says, "A true criticism upon many of our scientific experiments upon feeding is that the experimenters have taken too little account of breed and family peculiarity. Professor Sanborn after experimenting with different foods on the milk and butter producing qualities of cows of various breeds, came to the conclusion that a good cow will make a greater change in change of food than a poor cow.

Some interesting experiments on this subject have been made by Dr. Sturtevant. He started out to stock his farm in Massachusetts with dairy cows and for that purpose went into the rural districts with the intention of procuring the best milkers of mixed breeds which he could find. By paying a few dollars higher than the market price he was enabled to secure all the good ones that he wanted.

For three years this herd of selected cows, averaging thirty-three head, was kept and carefully fed and milked, with the following results. Average yield per cow for the three years 2,079 quarts. During that period there was fed on the average to each cow per year, 351 pounds rice meal, 879 pounds corn meal, 88 pounds cotton seed meal and eight pounds oat meal, at a cost of over thirty dollars a cow. Dr. Sturtevant remarks that a cow that will give twenty quarts a day is rare in New England, and that although in his search after first-class milkers he often heard of such cows and even bought them, he failed in getting them to justify the milking claims bestowed on them by their former owners. Only one cow in the entire herd ever gave forty pounds of milk in a day. It has been my experience that forty-pound cows are oftener heard of than seen and especially a cow that will keep up such a record for any length of time.

In making this statement I leave out of consideration the question of forced yields. Not satisfied with the performances of his selected cows, Dr. Sturtevant crossed the Atlantic to investigate the breeds beyond the seas, and his choice fell on the Ayrshire, of which breed he returned with a herd.

With the same care and feed the Ayrshires averaged for three years 2,666 quarts of milk, and whereas the thirty-three selected natives made only five yields of over forty pounds of milk per day, the ten Ayrshires gavo in the same time sixty-seven yields of from forty to fifty-one pounds of milk per day. Compared with these figures the average of the best dairies in the State of New York is 1,800 quarts per cow per annum.

As cheese producers the Ayrshire is also a notable example of "Breed superior to feed." We are indebted to Mr. Robert McAdam for a test on an extensive scale between Ayrshires and Shorthorns for cheese-producing qualities. He made cheese from the milk of sixty-four Shorthorns and the same number of Ayrshires for one season. The cows were pastured in adjoining fields and had the same care and treatment, yet the Ayrshire yielded cheese at the rate of nearly one pound less of milk to the pound of cheese than the Shorthorn. The average yield of cheese from herds of thoroughbred Ayrshires in Scotland is 500 pounds per cow for the season, while the average of 425 factories in the State of New York was 255 pounds of cheese for the season.

In 1885 careful experiments were made at the Ontario experimental station, Canada, to ascertain their value for the various dairy products. There were nine different breeds represented and all were fed alike. In summing up the result of this series of experiments, the Ayrshire is accorded the place of honor, as highest in mean value of milk, butter and cheese, the Jersey following with a close lead and the Shorthorn next. The effect of pasture on the milk of different breeds is also strikingly shown in the Ontario experiments, and here again the Ayrshire is at the head, giving richer milk on pasture than she did on winter feed, while the Jersey yielded to the watery influence of the grass by reducing the percentage of butter fat almost one and a half per cent. Were we to take an Ayrshire and plant her in the island of Jersey with its mild climate and fertile pasture, she would in all probability give less butter than the native Jersey, but were we to reverse the case and place the Jersey on the hills of Ayr with scant pasturage and cold damp winds, she would no doubt fail to come up to the yield of her hardier sister. What sort of cow is it therefore that we want for a variable climate? Is it the pampered child of luxury or the hardy rustler? We want the cow that most readily accomadates herself to her surroundings and is adaptable to change of climate and soil, and as grass is cheaper than hay and grain the cow that gives the richest milk on the former is certainly the most desirable and profitable animal.

The Ayrshire above all others, is such a cow. She will thrive and yield a goodly store of milk while grazing on the bleak sides of a Scottish mountain. She will do still better when taken south to the fertile meads of merry England. She is a favorite in Australia, and has been acclimated in Japan, and in this broad country she is equally at home in Maine or in California. She is the embodiment of economy and a most notable example of the text that "breed is superior to feed." The best authorities have long admitted that for the amount of food consumed, the Ayrshire is superior to all other breeds, and this superiority has generally been credited to a particularly perfect set of digestive organs, and recent investigations on the subject would seem to indicate that she can convert a large portion of the albuminoid matter of her food into milk which in cows with less perfect digestive apparatus would pass off through the waste channels of the body.

Although the Ayrshire responds quickly to superior feed, the quality of her milk, or I may say of any cows' milk, is not materialy altered by the same, that is, the total amount of solids is increased, but the composition, the proportion of fat, casein, &c., is little changed. An increase of rich food therefore not only increases the volume of milk but also the quantity of solids, thus yielding a larger quantity of both butter and cheese. Yet while believing that special feed will increase the solids of milk in proportionate ratio, still I do not believe in the statement or theory lately advanced, by a prominent writer on dairy matters that "no analysis has yet proved that the relative proportion of sugar, fat and casein, vary in the milk of different breeds." They *do* differ and analysis *has* proved it and the churn and cheese vat have proved it. Were it not so, there would be no breed good for any specialty. We might as well accept the general-purpose cow at once.

To show how breeds vary, I will give the analysis of the milk of three different breeds as made by Professor Cochran, at the State Fair of 1884. A Guernsey cow owned by F. M. Etting showed as follows:

Casein, 4.62 per cent.; lactose 3.78 per cent.; fat, 8.05 per cent.

An Ayrshire owned by the writer showed: Casein, 5.41 per cent.; lactose, 3.77 per cent.; fat, 4.87 per cent.

The mixed milk of eleven Holsteins showed: Casein 3.69 per cent; lactose, 4.61 per cent.; fat, 2.79 per cent.

A careful examination of these figures will show the absurdity of the statement that the relative proportion of the different constituents in the milk do not vary in different breeds. It also shows what is well known, that the Guernsey is more a butter than a cheese cow, while the Ayrshire holds the fort as a cheese producer. In conclusion, I think I have shown that while a cow will produce more milk on full feed than on short feed, the composition of the milk varies but little, only the total solids are increased; also that no amount or kind of feeding will change the constitutional characteristics fixed by generations of breeding. In other words you cannot make Jersey butter from a Holstein cow, nor Ayrshire cheese from a Jersey.

THE MILK AND BEEF TEMPERAMENT.

By W. D. HOARD, *Fort Atkinson, Wisconsin.*

[An address at the Washington Institute.]

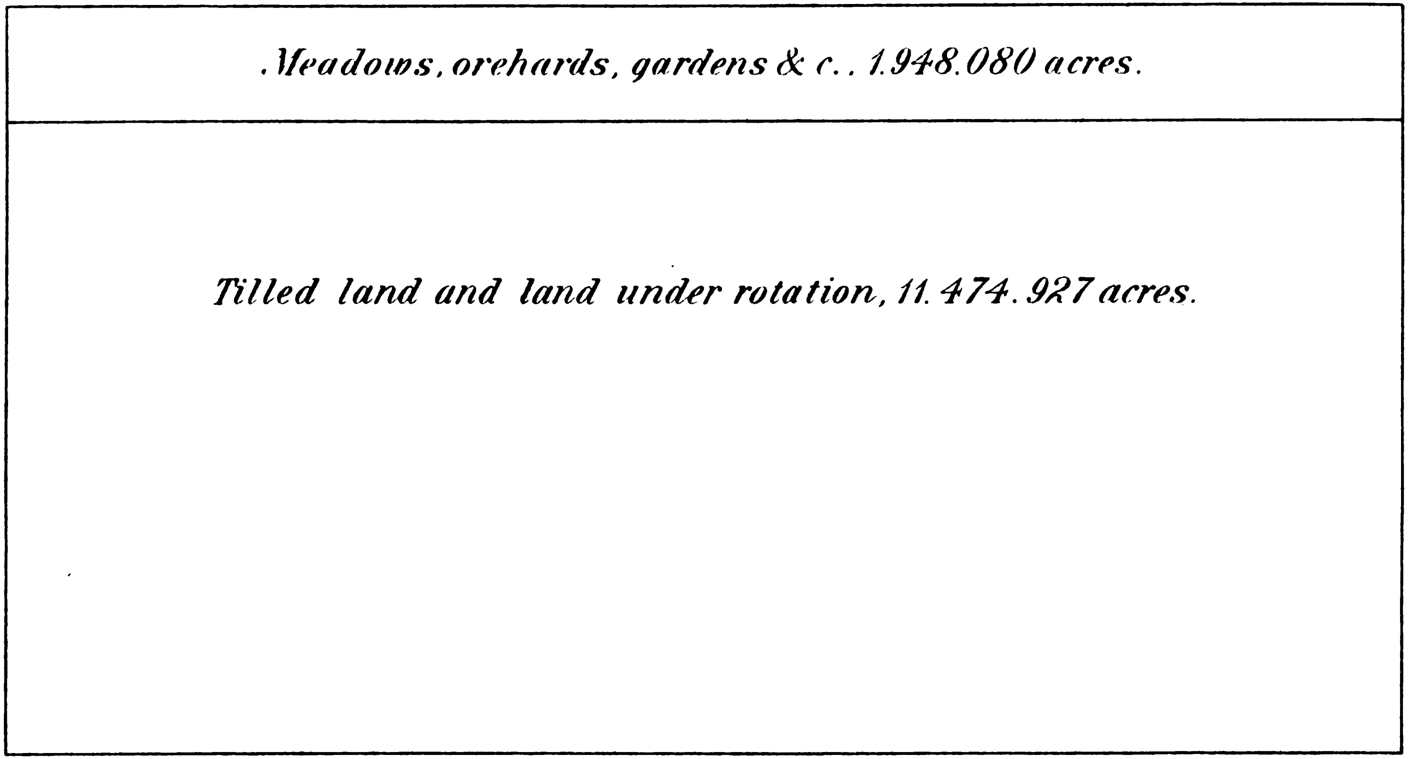
This topic is one which at first sight may not appear to be as interesting as some others, or interesting enough to claim the attention of an audience like this. And yet it is one which has occupied me with absorbing interest for thirty years; and I find myself to-day continuously threading the dark way connected with it with more interest than ever. I became convinced about thirty years ago as I entered my majority, having been trained by a very wise father and mother in the working of a dairy with the fact that there was a wide difference in the character of our farm animals. My own little experience on the farm taught me there was a wide difference in the physiological character of our cows; and constant observation and study convinced me that there were certain types and certain peculiarities that almost invariably accompanied the specific dairy cow. Still further observation convinced me that the average farmer had very indistinct ideas concerning this very important animal, and that there was a vast amount of error and erroneous judgment grouped the daily and yearly action of the average farmer connected with this animal; that there was a vast amount of error concerning her feeding and her care, a vast amount of error concerning what she is and what she is not. That in a large majority of instances men selected these animals, administered upon them and acted with them almost as much from ill judgment as from good judgment. I still further became convinced that physiology lay at the bottom of these specific differences in cattle as it does in men. And then I became convinced it was a duty to reach for the reason of these things; as St. Paul says, "Prove all things; hold fast to that which is good." I determined, if possible, what was the basis of the differences between these two peculiar ruling functions of our bovines. In what I may say to-day upon the dairy cow, let me state at the outset, that I have for fifteen years been studying upon this question of Temperament. I believe to-day that the differences in cows between the highest forms of the dairy cow and all the successive lower gradations until you immerge into the beef animal, are based upon temperament. What is temperament? Physiology tells us men are divided into certain classifications or temperaments. Now, these temperaments produce certain modifications of form or build; and you understand why function follows form. I quoted last night in speaking at the banquet, the Arabian maxim of two thousand years ago, which is as follows: "Form is everything to the Purpose;" and no man has studied the horse since who has elucidated a wiser statement, or that Form is indicative of function; form is based upon Temperament. Why am I a man with a nervous-bilious Temperament? Why am I a man with a peculiar build? Why is my friend Walker very much like me? Why is'nt he a fat man? As I observed to him yesterday, you might as well try to fatten a fanning-mill by running oats through it, as to make fleshy men of us. Why? Because we belong to a special temperament that is not given to the accumulation of flesh. Now, the bilious temperament grouped with the nervous, produces certain peculiarities of form. Did you ever see a piano player with a short, thick, fat, dumpy finger? Did you ever see a person of that build that was an expert seamstress? Did you ever see a lady who was very facilé with her fingers that had that kind of a hand or finger? If you have not, did you stop to ask why certain functions follow certain forms? Did you stop to think that it was based upon temperament? It is almost a matter of impossibility to-day to find a man of a nervous bilious temperament that has flesh, that is short, thick and heavy, or of a lymphatic build. There are exceptions in all conditions of life, but I have never seen one single instance, and I have been a very close observer of those things. Now, I want to go further and say, I have the milk function upon what may be termed in cattle, the nervous temperament. I allude particularly to the butter function, the power of large and profitable production; and as I explain that, I will call your attention to these three types of animals as shown in these charts. The beef animal, indeed, fills to perfection the expression of the lymphatic temperament: the Guernsey cow and the Holstein express the nervous temperament. Now, the nervous system has wonderfully to do with the production of milk. And I base this nervous theory upon these three premises; first, butter is produced by and through nervous energy. Let me call your attention to the fact that this great mammary gland here is enveloped by a wonderful network of nerves, and is united with the uterus by the same network of nerves that is called the sympathetic plexus. This combination of nerves enter the spine and passes to the brain; and from the brain to the mammary gland you have a marvelous combination of nervous action. Now, when you consider this function of maternity, this function of motherhood, when you study into the physiology of it, you find you are employing the nervous system in a wonderful way at every step. I said that butter was produced through and by the nervous machinery of the body. It is the maternal function designed by nature for the support of the offspring. Second, butter is produced from food largely composed of albuminoids, or nerve-supporting food. If you wish to produce fat in the body you can do it by feeding carbonaceous foods; but you cannot produce butter by feeding fat; butter is not produced from the oil in the feed. It is anamolous to all other fats in the animal kingdom and to be produced profitably requires a peculiar combination of albuminoid and carbhydrate food, the same as the lean meat or muscle, so we see that butter itself is produced largely from the nerve-supporting foods. Now, third, when butter is produced and taken into the human body and digested, it goes to the support of the brain and the nervous system. No other fat does that. Here lies the great indictment against bogus or substitute butters. Many men say oleomargarine is as wholesome as natural butter. No true physiologist will for a moment say this. Because, here, notice that butter is composed of eight essential oils, with traces of others, and the body fat is mainly composed of stearine and palmatine.

You have in butter fat a peculiar combination that isn't seen in any other fat in existence. Nature designed this for the support of the brain and the nervous system. Let me call your attention to the fact that to-day French, American and English physicians are asserting that sweet cream is one of the most valuable foods for patients low in nervous condition, taking the place of cod-liver oil. Therefore you see, in this natural butter fat we have something that no substitute butter will take the place of.

Now, a word as to the value of heredity. I base the dairy function on heredity and base heredity on the breeding and temperament. I show by temperament the production of a certain outline or form. We do not understand the value of heredity. I am not what I am, made by myself. I am what my mother made me. I am the result of what lay behind me in a thousand fathers and mothers. I am myself but the last expression of that heredity, excepting my children. Now, this question of heredity is a deep one. Men and women stand and look at their children and wonder they are so different from their parents, and forget that the children have a thousand parents behind them. This question of heredity is just as applicable to the dairy cow as it is to the race horse or the setter dog. Look for a moment at this marvel, the setter dog, or the fox hound. The one is trained by heredity and use to follow the track of birds; the other is trained to follow the track of fox. The bird dog will pass over a thousand fox tracks and never know it. Why? Because he has not found that for which he was bred; but the moment he strikes the track of a prairie chicken or a quail, every nerve in his body is eloquent the answer of his breeding to a specific purpose. The fox hound passes over a thousand bird tracks and never knows it. To him it is but a record that he cannot read. But the moment he strikes a fox track, up goes his nose and he exclaims, in answer to all the heredity behind him, "I have found it." Found what? "That for which I was bred." And still, my friends in the dairy cow here is a piece of heredity just as distinct, just as well defined as the fox hound or setter dog. There isn't a boy in Pennsylvania to-day who is fool enough to go out to hunt birds with a bull-dog; not a boy in Pennsylvania but what knows better than to do so foolish a thing as that. Yet his father will go on a hunt for butter with a beef cow.

We have not been obedient to the logic of our surroundings. We have gone on administering our judgments concerning our cattle without any regard whatever to natural laws. We are not students of nature. We are going along in a sort of mechanical, perfunctory way, doing something, we don't know what, and in a way we do not understand. If there is a man to-day that ought to be termed God's Vicegerent on earth, it is the breeder. Therefore I believe that the common farmer should earnestly stop and study these things as related to him and his own farm animals. It is time we did this. The low rate of production per cow and high rate of cost of keep in Pennsylvania and New York, and even in our own favored dairy districts in the west, is to-day taking the profit from us in a way we don't understand. It is time to stop and look this question in the face. Is there anything for us to learn in this matter?

Now, we will follow a moment, if you please, some of the physio-



DIVISION OF IMPROVED LAND IN FARMS IN PENNSYLVANIA.

Total area, improved land in farms. 13.423.007 acres.

logical outlines and distinctions that underlie the dairy temperament in cows.

I wish to make this intensely practical. I have spoken of the outline, that is, the theory. Now I wish to show you clearly how I judge a dairy cow, and why a dairy cow is constructed as she is. We start first with this Holstein cow Tritomia. She is a distinct type of the dairy cow and may be classified among the Holsteins, as belonging to the butter division of the milk temperament. She shows that in her outlines. I start first in my judgment of a cow, at the head. I look first at the brain, basing here the development of the nervous temperament. It is in the nervous temperament you find the largest expression of brain power. The dairy cow must of necessity have a powerful brain. She cannot be the profitable mother you ask her to be unless she has this development. Therefore she must show, in the first place, a long, clean, bony muzzle. She must show every place about the head an opposite tendency from the lymphatic temperament. She should show a wide muzzle, a large nostril and a long, prominent nasal ridge; a very clear, full eye; I want the eye to stand out full, for it is the peculiar expression of the eye that gives a very strong indication of the character of the brain. I will show you why these functions start in the brain, in a moment. I want the eye to stand out full, which, when so formed gives a dashing effect to the face; I want the brain to be long from the eye to the poll; the ear to be quite delicate in character. She should show femininety in every particular in the face; I want the brain to be active; the eye to indicate spirit. Look at this face; the pose of the head indicates the possession of strong, full nerve power; see the spirit that shows forth in that Guernsey cow "Select."

I look very closely for the joining of the spine to the head; if I find that a cow has a weak junction of the spine to the head, I leave her alone; she may be the best bred cow in the world; she will prove worthless, for no chain is stronger than its weakest link. I want the neck to be long, lean and delicate in character; the spine to rise full and strong in the neck; as the spine is but a continuation of the brain. I want the spine to rise full above a sharp shoulder; I don't want a beef shoulder on the cow. Yet there are exceptions to all rules. The famous Jersey cow, Eurotas, had such a shoulder, she had some points that were squarely against this line of description, and she was a wonderful cow. In this cow, Eurotas, the back-bone rises above the crops fully an inch. I had the pleasure of judging this cow at the Minnesota State Fair and giving her the first premium; the next day she distanced all competitors in the butter test, Jerseys and everything else. When I gave her the first premium in a class of forty-eight of judged cows, many of the spectators jeered at the decision. I heard them say repeatedly, "that man don't know anything about a cow, or he would not give that raw-boned angular cow the premium when there are smooth, handsome cows all around here; he don't know a cow when he sees her." I finally said, "gentlemen, this cow is in the test; I don't profess to be the wisest man in the world, but I have confidence sufficient in my own judgment to say this: the test is to be declared to-morrow; I will hang my reputation, as a judge of this cow, on the fact, that the cow will justify my giving her the first premium, to-morrow in the butter test." The next day came, and she won it, and then they came to me and asked me what I saw in the cow. I want the shoulder to be sharp, with a high chine back of the shoulder; the back-bone to rise full and strong after it leaves the shoulder, for here is the bridge for carrying the middle piece between the hip and shoulder; the back-bone supports the whole framework of the body. This cow is a large eater; she will crop in the summer time from seventy to eighty pounds of June grass. She carries a large weight of food and water; if she is a large butter and milk producer, she must have a large support. I want to see the brain have an unchecked course and the indications of nervous action and power runs through strongly from the beginning to the end; the loin must be frail and light; in the beef animal you want a heavy loin; in the dairy cow the ribs should spring obliquely; the hips should rise full and prominent; the ribs should be long and open-spaced; the middle piece strong and full and good length. Now, we come to a very important point. You see here the rise of the pelvic arch in which the spine rises full and high between the loins and the tail.

You hear plenty of men say: "I want a cow with a straight back from shoulder points to the tail.

I have heard Jersey men say the same thing; showing how the Shorthorn idea of the dairy cow had warped their judgments. I do not hesitate to say the mischief with all of us as dairy farmers in this country is, that we have nothing but a Shorthorn idea in our minds of the form of a dairy cow. I have heard men say, "I want a straight back," and the high pelvic rise such as we see here in Tritomia, they would reject. The pelvic arch is always indicative of strong maternal tendencies and these are just the tendencies we are looking for. The reason that so many men ask for a back straight from hip to tail is because they have no clear idea of the true confirmation of that expression of maturity known as the dairy cow. This erroneous notion has even spread to the Jersey breeders, and like many of their notions, is founded on mere fancy, or a desire for smoothness and harmony of outline. Such ideas do not belong to the physiological foundations of milk giving, but lead directly away from it, and towards the beef form. We must remember the beef cow is a miser, storing up and never giving forth until it is wrung from her, excepting you cut her throat. This cow is a mother. You have the two expressions of motherhood and miserhood. The dairy cow is a daily benefactor, and consequently she was constructed for the purposes of maternity. Now let us understand at the outset that the milk giving function in a large expression, produces a form and outline essentially belonging to itself and we have no business to inject ideas of form that are not based on this function.

I spoke to you of the nervous connection of the udder and uterus. Many men are all the time judging the dairy cow from the standpoint of the bullock; we will hear men say, "I want a cow to be hardy." For what? "O; I want her to be tough." Oh, yes, sir; tough for what? When you got down to the bottom, it is to lean up against the southside of a wire fence and meditate upon the inhumanity of that man who wants a cow to be "tough." They want them to be hardy as the bullock is hardy, measuring one thing by a standpoint that don't belong to it. Now, a cow must have constitution; but remember always, that old law in logic—"never compare things that differ." A cow must have constitution, but she should not be hardy in the general acceptation of the term; she must not be a rustler. A good cow must have an open rib; there must be an expression of relaxation there. Why? Because the very function of milk giving calls for a relaxel condition of the system. A compact close rib, shows that the machine is not " built that way, " consequently when you find a tight, strong, closely built animal like the Hereford before you, you have no relaxation whatever, and as a consequence, you have no enlargement of the milk function. In judging a cow, pass your hand down the rear of the horn; feel how these rear muscles are put together; if you find they lay open, so your hand will easily pass in between the layer of muscles, it is a good sign. The next time you have an opportunity to handle a beef animal, notice how close and compact these muscles are. Notice here this long in-curve in the hind quarter; notice there the full out-curve on the Hereford. Now, see how the nervous temperament produces certain forms. This long in-curve here indicates this cow is built for the udder and not *vice versa*. I have been asked how I judged the milk temperament from the butter temperament. I have been somewhat successful in selecting cows as buttermakers, without seeing them tested. I have done so from certain indications; many of these I cannot put in words. You ask me how I make a tone on the violin; I may tell you some things, but the tone I cannot describe you.

There is one excellent little sign of the butter temperament of a cow, it is called by some the flank gland, by others the butter gland; it lies right in here in the flank. As you pass your hand over it, it rolls under your hand like this pencil. The constitution of the cow is indicated by the navel, or umbilical development. A cow must have constitution, she must have ability to stand her work,—to take feed and manufacture it, and, with intelligent care on your part,—do her legitimate duty and sustain herself under it. But no cow can be expected to be hardy in the other sense that hundreds of men call for. How do you tell constitution? Is it something that is born in the individual; is it not bred into them, nor fed into them? As a soldier in the army I used to notice hundreds of men who would endure successfully all sorts of hardship, and others equally well built would go down under even light work or exposure. You may remember this yourselves, those who were old soldiers,—how one man would drop out and another would do double work and stand up under it. It was not the amount of food the men took, nor the training, but the fact that the one inherited constitution and vitality, and the other did not. I consider the umbilical development the finest sign of constitution in the cow, or horse or any animal, or in man even. If the muscle of the abdomen come together there strong and full, it is a sign that the cow has inherited a strong constitution; and it is one of the indications of individual potency. I first discovered this by seeing a regular army surgeon rejecting men in the army. I noticed that certain men that were strong men and well built men were rejected. I says, " Doctor, why do you do thus, that man appears to me to be all right?" He replied, " he has no constitution, he can't stand up under exposure." " Where do you see it? Right here at the navel. Constitution, vitality, virility are qualites that a man inherits; its something his mother and his father give him. It can't be fed into him or trained into him, but this is imparted to him by his mother through these organs, and if there is a weakness there, it is clean cut evidence, though he may be strong in other parts, that there has been a weak constitution imparted to him through his mother." He says, " I have never seen it fail yet." I asked, " did you ever carry it over into animals?" "I have with the horse and found it to be true. I took it up and went into cattle with, and I have data covering over three thousand cows and I have never seen a single instance fail yet. If the naval hangs pendant it is a good sign; and as you pass your hand under the belly it is well to find a strong grouping of muscles to the navel, bringing it up full and strong. Now you see our reason for the old saying "that we want to see in a good cow a strong development of the abdomen." She has this heavy load of food and water to carry, she must carry herself also. She needs strength and vitality here. This cow Tritomia is faulty in the shape of the udder; it should have projected forward more on the abdomen further. If you are judging a cow take the highest point of the udder behind and the furthest point on the abdomen and draw a line from point to point. This I call the "line of absorption against the body." The longer this line the more will the udder absorb the strength and energies of the cow. A narrow pendant udder is indicative of a weak and non-persistent milker.

I told you yesterday of a little cow of mine giving me 3,240 pounds of milk in ninety days, and making 160 pounds of butter. The was a remarkable cow, in the length of this line of absorption, the udder rising high behind and extending forward well in front, and she had great capacity and power as a cow, although she weighed but eight hundred pounds. This line is one indication you should bear in mind always. Constitution is also indicated by the development of the lungs. I told you I wanted a wide nostril. Watch men; if you find a man that shows a very wide nostril you almost invariably find him a man of endurance.

The ribs should spring low and the shoulder should lean, and the right pitch of the cow is of some importance. In the trotting horse why do we look for a sholder well back? The reason of that is, that the forward legs may have free action and be lifted easily for their work. The back pitch of the shoulder indicates the front action of the horses legs. In the draft horse we want a more vertical pitch of the shoulder, which brings the shoulder square with the line of draft. Now, in the dairy cow we call for a lean shoulder. Here you have the strong, upright, draft shoulder—the shoulder of the draft horse; in the dairy cow you have the shoulder that retreats more; in this case you have the conformation of the nervous temperament.

I want to say one word as to disease; in the dairy cow you have a predisposition to dairy diseases. Among them is milk fever. What is milk fever? It always starts with a chill. I spoke to you about the sympathetic plexus that connects the udder with the uterus and both with the spine and brain. Milk fever commences first at the uterus, following this sympathetic plexis, it enters the spine at the lumbar region and paralysis of the hind parts at once ensues, and the cow drops upon the ground and is helpless. It further involves the spine until by and by it strikes the brain, and the cow swings her head to one side and dies, a victim to her own maternity. What caused it? Nine times out of ten the unthinking, unsympathetic action of the owner. If he understood he was dealing with a mother and not a bullock, he would guard her against the first inception of the disease.

Invariably it is the best cow that has the milk fever—the cow that has the nervous temperament—that cow becomes a victim to our own lack of thought. I have never seen a case of milk fever cured, when thoroughly seated.

I have prevented many cases of it. It usually comes from two to four days after calving; and I have seen cows show symptoms of it—that peculiar look the cow will have in the face and eyes. I have been able to stop it there; I never lost a case in my life in my own cattle; I have handled about twenty cases that I knew were predisposed to it. Prevention is better than cure. Take excellent care of the cow—this wonderful mother; be kind and sympathetic to her; remember the natural function is one you can easily underestimate. I stepped into my stable with my little cow Dolly—I was engaged in studying her with the oil test; every morning and night I weighed her milk; and each time I would take a sample and reduce it to oil to see just what disposition of butter fat there was; you can hardly imagine how wonderfully this butter fat fluctuates up and down in the milk; it is the effect of nervous action—I stepped into the stable and set down to milk her, and as I did so I gave her a rake across the flank with a sharp pin; the little animal made a jump—she was particularly fond of me—she whirled around and looked at me as much as to say, "can that be you?" And the drop in the butter fat for that milking was fifteen per cent. in her milk for that little piece of cruelty. I was after the fact. I had to beg Dolly's pardon, but I must have the fact. I had two cows last summer, while engaged in this oil test, which we use as a daily thermometer to see just how the butter fat acts. An electric storm passed over the country, deranging all the instruments; my three cows responded to it with a loss of butter fat. We took last summer over twelve thousand tests in our creamery. Now, what shall we do with this animal? It will pay any farmer to study the physiological principles that govern the outlines and contour of a good cow. A lack of this study may cost a man the loss of the best cow in his herd. I stepped into a herd to look at a farmer's cows; I say, "Tom, I want to buy a cow;" he replied, "I've some to sell;" "What do you ask?" I will sell your pick in this herd for sixty dollars, or you may have my pick for twenty-five dollars. It became important for me to let Tom unfold his own ground. I says, "what would be your pick?" He pointed out a little half grade Jersey cow; I asked, "what is the matter with her?" "Why," he says, "she don't give any milk." "How much does she give?" "Twenty-five pounds a day." "Well, Tom, what would be my pick, do you think?" He pointed to a large grade Shorthorn cow giving forty-five pounds a day and says, "there is the cow for me; you may have her for sixty dollars." I looked over both animals and told him I would take the little cow; he looked surprised; and said, "I thought you claimed to be a judge of a cow?" "Well," I says, "I get off the point occasionally." "I should think you do," he replied. I took the cow home. Very often a cow will not come to her natural flow of milk in a month, but you can bring her round to it in a day or two. Take the card and proceed to card her and she will be very apt to rejoice that she has changed owners. I took the little cow home and commenced carding her and petted her a little, and got her very soon to her full flow. I then tested the milk; she was making me a pound and a half of butter a day. I went over and took a test of his large cow and she made a pound and a quarter a day from forty-five pounds of milk. When the farmer woke up to the fact he had sold me the best butter cow in his herd for twenty-five dollars, he says, "Confound the luck—thats always the way;"—they call it luck—"why didn't you tell me she was a butter cow?" Here is where a man can make a practical benefit to himself in studying to become a thorough judge of a cow.

Discussion.

Do you attribute milk fever to chills?

It commences that way.

Why is it milk fever always comes in hot weather but never does in cold weather?

I do not understand that it is so.

I never saw a case in winter. At one time every cow on our farm was dead but one, and she required four men to hold her up.

Are you sure it was milk fever?

Milk fever is known among human beings as parturient fever; it is the same disease exactly; why we have more in June and July than the winter months is because you give the animal more exposure, and don't realize the reduction in heat at night. We don't realize the radiation of heat at night from the animal. It is well to take a cow before he scalves, says four weeks, and commence feeding a small handful of ground flax seed, to get the bowels open and all feverish symptoms of the body worked off. You will find heat useful in driving off milk fever. If a cow shows indications of milk fever, the best remedy I have ever found is aconite and belladona, sometimes arsenica; with this addition, of covering the cow from head to foot with heavy blankets; and take a hot fat iron and iron the spine the whole length from head to tail. This will start a counter irritation with the heat; it will aid you very much.

Do you use stimulating liniments on the spine?

I never did.

Do you feel the hide of a dairy cow?

I always want to get the feel of the cow; the hide of a beef animal should be soft and flexible; the feel should be unctuous and oily; the dairy cow should have a flexible skin, but not too thin; it should show firmness in the hand; different breeds of cattle differ; the Guernsey breed is remarkable for the softness of their feel; the Holstein breed handles with more firmness; the Jersey cattle midway between; but in the dairy cow, the feel of the hide should not be one of extreme softness and flexibility, but one that indicates power and vitality.

In regard to the typical wedge shape of the dairy cow; isn't it an indispensable quality of a perfect dairy cow?

The perfect dairy cow should be wide behind; she should not be wide from having a thick ham; but because the pelvis is wide, and that gives her a wide build with an opportunity for a large udder between the thighs.

In selecting a cow do you pay any attention to the escutcheon?

I pay but little attention to it, and all I ever did pay to it has led me wild; I think it is worth something but not much as a single indication.

Some lay considerable stress on the rise of the backbone in front of the shoulder; do you ever pay any attention to that?

No, sir; I don't as a point; I have spoken of the great value of a full strong backbone but I want to see it full and prominent from head to rump. It is here I look for indications of that nervous strength and vitality that I consider the foundation of a profitable dairy cow.

How about the color of the skin?

Yellow skin indicates yellow butter, but is no indication of quantity.

If you have a yellow skinned cow in a herd, would it streak the butter?

I would mix the milk.

Will yellow cows always give yellow butter?

Usually they will.

You said nothing about the tail of the cow—I mean of the length and shape.

I think myself that the tail is to be considered, mainly as an indication of spinal development; if the tail is long it indicates an excellent character of spinal development; it is but a continuation of the spine, you know; it is of the same vertebrated character; but I don't think it has any significance belonging to it directly; remember a strong spine is indicative of a high degree of nervous energy. Now, one thing, a cow giving a pound of butter a day, making its equivalent in casein and other solids, is subjecting herself to more nervous strain than a horse pulling the plow from morning until night; it is a more serious draft upon the vital energy of the animal.

What connection has the hollow-horn with the diseases you speak of, or is it a separate complaint?

I don't believe anything in hollow horn. I don't think it is any disease at all. There have been over five hundred cows dehorned with in a radius of about ten miles from my town this fall, and in over fifty of them the horns were hollow, and the cows were as tough and hardy as they ever were. And I made up my mind that many men have been misled by that fact; it is an individual characteristic with many cows to have hollow horns. Some man had a sick cow and bored in and found the horn hollow.

I mean, is there a disease called hollow-horn; a cow suddenly stops giving milk; she gives this morning about the usual quantity of milk, and perhaps this evening don't give more than a pint. We put on turpentine occasionally which seems to help her?

That might be a special spinal disturbance; you use turpentine around her head and you create a very powerful irritation of the tissues, and you may in turn create a more favorable action of the brain and spine; but the disease commonly called hollow-horn I have no faith in.

Would it be wise to treat that disease known as hollow-horn with turpentine?

Turpentine is a dangerous remedy to handle; that is, it is a dangerous remedy if it is not used with skill and care. I have always been very chary about the use of it, and I should much prefer, if the cow should show symptoms, to produce the same effect with a hot cloth or with a cloth wrapped about a hot iron. Take a piece of cotton cloth and wrap it around a hot flat-iron and lay it at the point next the head and run it along the spine, and if it gets unbearable move it back along the spine. I think you will accomplish the same result and leave the animal in better shape than with turpentine. These disturbances are found repeatedly in the production of milk.

You speak of cows being dehorned; what is the effect upon them as dairy cows?

Well, I am not in favor of it; I never would dehorn a thoroughbred bull under any circumstances, nor a cow; I believe it will prove disastrous; there is a very close connection between the horn and the genital organs; but men are plunging along in the west on this question; it does not seem to affect their milk, but no one has discovered yet whether it affects the secretion of butter fat or not, and I am very confident it does; a cow will often keep her flow of milk and lose half her butter fat. Mr. Goodrich of my own county related to me the other day a corroborative circumstance. He has a grade Jersey heifer giving forty-four pounds of milk a day; he was going to make a week's test of her, he had made a four days' test and was going to make a week's test by commencing in the morning; she had calved, I think, about ten or twelve days before, and was still full of solicitude for her calf. She got with some young calves and before he got her they had drained her dry of her milk; but she was wild and excited over it. They were all plunging about her in all directions; she got extremely excited; that evening she gave twenty two-pounds of milk; at her previous milking of twenty-two pounds of milk she gave six pounds of cream, making a pound and a half of butter at a milking. She gave him that night as I said twenty-two pounds of milk but only a pound of cream, after standing thirty-six hours, showing the fact that her mental disturbance had cut the butter fat out of her milk as ether would, and still she gave about the usual quantity. The next milking she commenced increasing in butter fat, and about the third or fourth milking she regained her normal condition. But if you watch cows carefully with the oil test you will be filled with wonder.

Last summer I told the boy he had been stoning my cows; he was driving my cows to and from pasture. He wondered how I found it out; the oil test told me; I didn't know he had been stoning them, but I knew something had been disturbing them and I took it for granted what a boy would do; I happened to guess right. I told Jimmy I did not want him to stone my cattle any more, nor run them.

What has been your observation as to size and shape of the horn?

I don't place any significance upon the horn as indicating dairy quality, excepting that I want the horn to indicate feminity; I want a slender horn; I don't want a steer's horn or a bullock's horn. My taste is a long curved horn, I don't place any significance upon the color of the horn.

PUBLIC ROADS.*

By Dr. J. P. BARNES, *Member from Lehigh, Allentown, Pa.*

In no branch of art do our ancestors seem to have been more deficient, or heedless, than in that of making roads and keeping them in constant repair. Even in this enlightened age, in this thickly populated country, so diversified and manifold with public roads, which are made use of constantly, both by man and beast, for traveling and conveyance, day and night. With all knowledge of these facts we still show a deficiency in constructing roads and keeping them in repair, astounding, this should no longer be overlooked. There is no efficient excuse but that we should have reasonably good roads in all parts of our country, at all seasons of the year. The condition of our roads vary according to the nature of the changeable soils of which they are made, the frequent and heavy rains to which they are subjected, the vicissitudes of our changeable climate, especially the freezing temperature of our severe winter months, and the thawings that follow in the spring season, which in a soil of clay or loam puts the roads into a terrible and at times into an almost impassible condition. The continual use to which they are subjected, the heavy burdens transported over them, and at some places, the stones in and on top of the road-bed, the ruts and gullies that gradually, but surely, come, because the roads are seldom made in the right season of the year, or with a view of permanency and durability, but usually in a hasty, temporary and in a careless and indifferent manner. The object and aim of many of our supervisors seems to be, how many rods can be repaired in a day, instead of how effectual and substantial the work may be done. The result of all this is bad roads beyond a doubt. By having bad roads, wagons are strained and tried severely. They frequently break down and cause delay and vexation. They will last just about one-half the length of time they should. Horses are injured and abused and frequently ruined, so as to become useless before one-halt of their life service has been rendered. The teamster is frequently vexed and severely tried, so much so, that a great many of them lose their better judgment, curse their Maker and with the cart whip slash and cut the poor brutes until their arms become lame, and at the same time subject themselves to be prosecuted for cruelty to animals. These assurances I have no doubt have been witnessed by some present here to-day.

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*The essay of Dr. Barnes was illustrated by a model, showing the effect of different elevations, and so graduated as to give his hearers a distinct idea of the raise due to elevations as expressed in degrees, and as they are usually found on our public roads; the essay and address was also illustrated by a model of a farm wagon which was shown as upon hills of a given elevation expressed in degrees. It is to be regretted that these illustrations cannot be given with the essay as they added greatly to its interest when read before the board. SECRETARY.

We, a people of great activity and more than ordinary enterprise, always ready to advance and make improvements in art, mechanics and agriculture, ready to substitute machinery so as to lessen labour and be able to produce the greatest quantity at the least cost, to benefit mankind and help enrich those who engage in the manufacture of different kinds of commodities. Inhabitants of a State of wealth and prosperity, abounding in a variety and an abundance of minerals, manufacturers and not one of the least in agriculture, we are considerate and liberal in arranging our dwellings in accordance to the most approved plans for convenience and comfort to their occupants, to adopt the latest and best means of heating, to purchase the best improved lamps, so as to be able to light up every nook and corner of our rooms, in fact there is no improvement of merit, but what our people are ready to purchase it, and make practical use of the same, in many instances regardless of cost.

We build large and stately barns to house our cattle and horses comfortably; arrange these buildings to give a free circulation of air during the hot months of summer, and close them up sufficiently tight to keep out the cold frosty air during the winter months, we give much attention to the care of our animals, to make them comfortable and endeavor to keep them in a healthy normal condition; by doing so we not only add to their comfort, but, at the same time; we profit thereby. You may question in your minds what has this to do with our public roads. It shows that we are ready and willing to spend money and do what we can for our comfort and convenience, and also for the brutes under our care.

If so thoughtful and ready to invest money in this direction, why overlook the importance of putting more money into the improvement and repairs of our public roads, to the advantage of ourselves and the welfare of our animals, and have good roads, both for man and beast? Pennsylvania contains forty-six thousand square miles, a State of no mean area, nearly one-half of which is improved land, occupied by cultivators of the soil; it has a population of over four millions. The census of 1880 informs us that three hundred and one thousand and one hundred and twelve of this population are occupied in tilling the soil.

The improved land worked by these tillers of the soil, aggregates thirteen millions four hundred and twenty-three thousand and seven acres, valued at nine hundred and seventy millions six hundred and eighty-nine thousand four hundred and ten dollars, these acres are divided into two hundred and thirteen thousand five hundred and forty-two farms, upon which are used five hundred and thirty-three thousand and eighty-seven horses, twenty-two thousand nine hundred and fourteen mules, fifteen thousand and sixty working oxen. In addition to these we have in the State about one hundred thousand horses and several thousand mules, their total value is about forty millions of dollars. Pennsylvania may have fifty or sixty thousand miles of public roads, this is a guess—should there be some one present who can give the number of miles of roads in our State I shall be pleased to have him give me the correct figures to substitute in place of my guess—these roads are daily traveled—more or less—by a portion of the six hundred thousand horses, and twenty-five thousand mules, and by a great many pedestrians. If it were possible to sum up the number of miles of public roads in Pennsylvania that are traveled daily, the number of vehicles of light weight and wagons of heavy weight, the great amount of products of many kinds transported to and from over these roads, the number of beasts required to do all this trafficing, we may well ask, what is the condition of our roads for the vast amount of use they are subjected to? Should we then not have good roads when so much use is made of them day by day and year by year?

Good roads will spare the teams and help to keep them in a good condition so as to be able to give a greater amount of work and more years of service. We know that a horse that has been strained and become sore and galled, by usage on bad roads, and abused by a heartless driver, that he is not able to do the same amount of work or last as long in service, or life, as a horse that is kept in a good condition, and carefully used on good roads.

This also applies to wagons used on bad roads, they will have to carry less weight, will become strained sooner, break down and wear out in one-half the time then one otherwise under the same conditions will on good roads. All vehicles are built to be used in accordance to their several capacity, and will wear their full length of time if properly used and not abused on bad roads and by overloading, their time of service can be materially shortened by fast and careless driving and by carrying overloads on bad roads.

Should we then not put more money into the construction of our roads for their improvement and bettering; by not doing so we are compelled to buy more horses, because they wear out sooner, feed them more oats, feed replaces the exhausted power, therefore where more power is needed more feed is required. Oats to the horse is what fuel is to the steam boiler.

We are compelled to buy a greater number of wagons because they sooner wear out and are set aside as useless, the teamsters frequently become sorely tried and vexed, meet with many disappointments and losses, all for want of good roads.

I shall now endeavour to show by practical illustration, how much we lose in different ways by not having our roads properly constructed and having them in a bad condition, and thereby demonstrate the advantage and necessity of having good roads.

I here have a small wagon, one-tenth the size of an ordinary wagon, it weighs three and one-half pounds, to move it on the level it takes a fraction of power equal to one-twentieth of its weight which is nearly three ounces, which proportion of power is applicable to all wagons of ordinary height of wheels, this shows how easily a vehicle is moved over a level, smooth, hard surface, a wagon of one ton weight will require a power equal to one hundred pounds to move it over a level, smooth, hard surface, one of two tons weight a power equal to two hundred pounds, which proportion of power, as said above, is applicable to wagons of all weights, set upon ordinary height wheels.

To take a wagon of one ton weight and move it out of a break in the road of five degrees in depth, it will require a power equal to two hundred pounds, just double of that required to move the same on the level, the power required, will vary more or less in accordance to the depth and width of spread of the break.

By striking a stone one inch in height, it requires a power of two hundred pounds to lift the wagon over the obstruction, and when two stones of this equal size or a bar is struck by both wheels of the wagon, at one and the same time, it takes a power equal to four hundred pounds, and when all four wheels strike a stone of that size, at the same time, it requires a power equal to eight hundred pounds to pass it over, just in proportion to the size of the obstruction the wheels come in contact with, the power required will be diminished or increased at the ratio of about twenty pounds to one degree of the height of the obstruction to be overcome.

To draw a wagon of the same weight, up a rise or ascent at an angle of twenty-two and one-half degrees, it will require a power equal to five hundred and fifty-five pounds, over one-fourth the weight of the object to be moved, the power for different degrees of ascent also varies in accordance to the rise of ascent to be overcome, a rise of eleven degrees and a fraction requires but one-half of said power, and a height of forty-five degrees will require double the power of that required to overcome twenty-two degrees and a fraction of a degree.

This ratio of power is also applicable to bad and muddy roads which is to be estimated according to the depth and consistency of the mud to be overcome.

A wagon is moved with the least resistance when the load is evenly balanced upon its wheels, just in proportion as the weight or load is thrown to one side, the resistance is increased to the amount of the additional friction caused thereby and greater power is required to move it.

A wagon of one ton weight is easily moved over a level hard road, but when it is to be drawn over bad or muddy roads, or over an obstruction, or up an ascent, the power required, doubles, triples and quadruples in accordance to the rise to be made or the obstruction to be overcome.

We hereby learn what are the difficulties in our roads to be overcome and that should be avoided, and what additional power is required to overcome the same; also, what additional expense is incurred to provide this power and to replace it from time to time and keep it equal to its requirements, while we have it in use. This expense could be lessened at least to the amount of twenty-five per cent. provided our roads were constructed and kept in repair as they should be.

This brings up the question how shall our roads be prepared to as far as possible avoid these difficulties and obstructions. So as to provide free and easy travel for vehicles and beasts, as far as circumstances will admit of.

The width of a good road should not be less then thirty-three feet, it should have no steep ascents or descents, but be graded as near level as the topographical changes of the route will admit of it. It should be slightly convex, the degree of convexity should be governed in a great degree by its locality and the nature of soil, a road formed of soft material requires a greater degree of convexity than one of hard materials, for the obvious reason that water injures a road made of soft material sooner and to a greater extent than it will a road made of hard materials, it should have the least possible convexity consistent to a proper drainage of the road.

It should have no loose stones on its surface, nor in the road bed that would be likely to work out on top of the road. The breaks, when necessary, should be made as shallow and as wide as circumstances will admit of, thereby save both horses and vehicles.

It should be built in view of permanency and durability and have a hard surface wherever it is possible to procure the materials for that purpose. All parts of its surface should be as near equal as possible, and desirable for driving over. Then the driving will likely not all be done in one track only, to form furrows and gullies, the first signs of decay.

To accomplish the improvement of public roads in this advanced age, it seems to be indispensibly necessary to have a good road machine. The localities that never had made use of one, cannot comprehend the great advantage to be derived therefrom, as well as the great improvement made in roads where they have been used.

We must determine that more money shall be expended, more care be adapted in their construction, and repairs of the same, and last but not least, see to it that good men are elected as supervisors, men of ordinary intelligence and of reasonable conception, who are not afraid to incur a little more than usual expense in giving us good passible roads for both man and beast.

THE BEST WAY.

By J. W. MATHER, *Member from Tioga, Wellsboro', Penn'a.*

The subject of highways in all its important steps, from the view to lay out to the use and occupation by the traveling public, is one of immediate importance to every citizen of the Commonwealth. The subject under consideration is similar to a great many other of like importance, the wants and taste of the mass of people who use the public roads, more or less, influence those who make and repair them. In looking back through the past centuries we find that in all countries the highways of a given period was good or bad, as the country in which they were located was prosperous or otherwise. More than fifteen hundred years ago the Roman Empire had between four and five thousand miles of paved roads which have not to this day been worn out. Reaching out from Rome in many directions to the frontiers of the Empire, these roads were constructed at an enormous expense for the purpose of uniting the distant provinces by an easy and rapid intercourse. The first thought of the Roman, who conceived the idea of a broad and well-built road-bed, was to facilitate the marches of the Roman armies, and that the courier might know just how far he had traveled and to locate his position the entire distance from city to city was accurately surveyed and milestones located along the entire route. The Emperor of Rome had erected, five or six miles apart, station houses at which was kept forty horses, each as relays, by the means of which it was easy to travel a hundred miles along the best roads in the known world. It goes without saying that those roads were constructed for the sole purpose of carrying on the public service. It very seldom happened that a private citizen was allowed an extra horse, without permission of the Emperor. To show the contrast of good and poor roads we only have to refer to the conditions of the public roads in England as late as the seventeenth century, when members of Parliament and other officers, lost their way in going from their town to the Capital, and guides were as common as conductors on railroad trains are at this day. Think of the enterprise of a country and its people when it took five hours to travel fourteen miles on the highway. How changed now. The traveler can now ride a bicycle on any road leading from London with ease. I have given these illustrations to show that the wants and taste of people give us good or bad roads. When the people of England learned that it was necessary to facilitate business and a pride in the prosperity of the country demanded a better road law, it was passed without objection, and a radical change was made in the laws and have since been rigidly enforced.

With all the history of the past before us and the experience of our own people, and the known and acknowledged need of good roads in every township in the State, we have not solved the problem of how to make and maintain the best way.

Do we need more and better legislation on the subject? We all with one voice answer yes. How shall that be accomplished is what this State Board of Agriculture has been considering for the past seven years? The object is no nearer accomplished now than it was at the beginning. The laws we now have, if enforced, has been admitted by an essayist of this Board (the Rev. W. L. Bull, of Chester county, last year), would give us good roads, and gave three or four reasons why the office of supervisor was a difficult office to fill. If the best way was adopted it would be the easiest office to fill in the township. Because the taxpayer would know that the better roads the more valuable his individual property, the less expense in transportation and less taxes to pay. What improvements are made in the public roads, I assume must be made under the present law for a long time to come, as no new law could be passed that would apply alike to the whole State. Is it not a better way to enforce the existing laws than to wait for new and uncertain legislation? The first step to take, the first object to be obtained, is to enlist the taxpayers in the importance of good roads, and educate them to the idea that one thousand dollars invested in substantial work is worth more than two thousand dollars expended in making over roads year after year. If the citizen of any township in the State will take an honest pride in the improvement of the roads and do an honest day's work, and see that his neighbor does the same thing, and all work for the common good, in five years, without increased taxation, the roads of the township will be in perfect order. In sparsely settled townships and in older settled portions if a road is needed that would be too burdensome for the township to bear, the count yshould be called upon to assist in its construction, an act was presented to the Legislature a few years ago and passed in the House of Representatives, but did not survive the journey to the Senate Chamber. I know of no good reason why the burden of building an expensive road should not fall upon the county as well as that of an expensive bridge.

While I believe the control of roads should be under the supervisors of the several townships, that the people may be more intrusted and an economical disbursement of the taxes be directed, that does not argue that county aid should not be given.

As a matter of education, the ordinary taxpayer has not yet learned that it pays to make roads according to law and the report of the viewers. The law is plain and explicit, all roads made under the provisions of the general road law must be laid on a grade not to exceed five degrees elevation, except in such places as it is impossible to comply with the law. Roads are ordinarily let by contract to build by the rod, to the lowest bidder, in order to save money, and usually to persons of little or no experience in the task undertaken. The township is cheated, the supervisors disappointed, and the traveling public are unhappy when they travel over an unfinished road, and year after year it costs as much to repair the road as the original cost of building, this all comes about for lack of funds, enterprise and of knowledge, a total disregard of the interests of the traveling public. Selfish motives sometimes prompt men to leave undone many things that should be done. It sometimes seems that men work harder to avoid an honest day's work on the road than it would have required to have performed their simple duty, and again it too often happens that the man who has the largest tax to work out, has the duplicate placed in his hands simply because he has a large tax, not because he is the best qualified to superintend the work, and a large share of the tax is lost to the township through indifference and lack of knowledge. The best way never studied, the most work for the least money never practiced. Skilled labor should be employed to build and repair wagon roads as well as railroads. The compass and level should be used on the highway as well as the railway. I never have been fortunate enough to see the man with an eye as accurate as the surveyor's chain or the level.

Can it be said that it is not science and scientific knowledge required to lay out and build a road?

What should be expected but a poor road when a cempass and level is never used in its construction? The viewers lay the road and make their report to the court of quarter sessions; the use of surveyor and instruments from that time are disregarded. The work is performed without reference to the survey and when left for public travel is half completed, and oftentimes not where laid by the viewers. A competent surveyor should be employed wherever a road is built or worked. He should establish grades, locate bridges, sluices and barriers, and enforce the erection of guards along dug roads and dangerous places, that travelers may be safe either by day or night; guide boards should be erected at all road crossings, and a general oversight of the laborers employed on the roads. Work should be planned in advance, that men and teams may not be idle for want of material and directions. Roadmaking, like everything else, needs a boss, a man interested in the work who understands what is required and who will see that the work is properly and faithfully performed.

The best way is to make and improve the roads of the respective counties under the existing laws, not wait for somebody to have a law passed that will make it easier or better. The Legislature cannot make the roads any more than it can cut Canada thistles, set out shade trees or place watering troughs by the roadside. Enterprise, pride and a desire to excel in having the best roads, a genuine strife in that direction, will stimulate the whole country to activity, and when that is done, poor roads will be the exception. I assume that this can be accomplished under the existing laws, roads can be made on as good a grade as though the taxes were paid in cash, and in as substantial a manner. I know of no reason why the several townships cannot own all the machinery necessary to do the work on the roads. It does not require an act of the Legislature to enable the supervisors to buy scrapers, plows and shovels, or to hire them if owned by a private citizen or company.

I care not what laws are passed to improve the system of road building, if the people do not want good roads they will never be built. When men are made to know that it is a benefit to them personally to have good roads, good roads will be built, whether it be under the present or any other law. That has been demonstrated time and again. If the merchants and business men of a town or city require better roads to increase their business or draw custom from other towns, they are built regardless of expense, regardless of the law. Let that same enterprise and business sagacity persuade the whole community, the best way will be studied and adopted. The weary traveler would not recognize the way that was once rough and rugged, so changed would be the net work of our county roads that it would be a pleasure to travel and a pride to the citizen. Every township would adopt its own laws and men would learn that the work of twenty men with plow and shovel could be done with two teams, three men and improved machinery.

The time will never come when the work on the roads can all be done by machinery, hand labor must be employed, more or less, according to the necessities of the case, and in nine counties out of ten in the State, all would have an opportunity to work out the taxes if the most improved machinery was employed.

FARM PAPERS.

By Hon. JOHN A. WOODWARD, *Howard, Penn'a.*

Something more than thirty years ago, when I was a big, awkward boy, proud of the hayseed in his hair, but regretful that his fingers had grown so stubby with weeding in the garden, picking corn and potatoes, and all the multifarious duties that the hands of the average farm doys are called to perform, I left my father's farm and entered a printing office, resolved that the halo of glory surrounding good old Benjamin Franklin's name should be far eclipsed by the time that I had completed my apprenticeship. That is not the only resolution of my life that has failed to materialize, but I cannot now recall any that met with a more inglorious and complete smashing up. However, the interest that I acquired in newspaper work has always continued, and indeed my connection with it has never been absolutely severed; so that when in still early manhood, I found myself again a farmer, it was but natural that I should become a reader and somewhat close observer of farm papers, and take a hand in helping make them. And so, occupying as I do, positions on both sides of the question, when invited to take a part in this convention of farmers, it occurred to me that I might profitably say a word upon the relation of farm papers to farmers and farming.

I do not believe that either editors or readers, as a class, fully appreciate this relation. If they did, editors would strive harder to make better papers than they do, and farmer's would read them more generally and more carefully, and make better use of them than they do. If I can give those who honor me by hearing me to-day, a clear understanding of the fact that good farming and good farm papers have an intimate connection with, and are largely dependent upon each other, I shall flatter myself that my coming among you has not been entirely in vain, and that I have added at least a mite to the aggregate of good results which I trust shall go out from this institute.

That there are grades and classifications of the so-called farm papers, is self-evident to all who read, and I am sorry to know that there are some that cannot properly be placed in either of the lists headed good, better or best. It is, however, only of them that I shall speak. With those fraudulent and mushroom-like concerns that spring up from time to time, for the sole purpose of either catching some of the advertising patronage which is always seeking channels of communication with the reading public, or of furthering the interests of some swindling enterprise which is excluded from the advertising columns of self-respecting journals, I will have nothing more to do than warn those who hear me against giving them countenance.

Of that class which are simply annexes to honest and reputable business houses—dealers in goods purchased by the farming public, as seeds and implements, and are published merely as a means of advertising their own excellent wares and legitimate business, I need say nothing, for "verily they have their reward." So when I speak of farm papers let it be understood, that I refer only to those upright, honorable, enterprising publications, which depend upon their own legitimate business for support, and are conducted upon business principles, for the joint benefit of their proprietors, their readers, and their advertising patrons. I could name many, but I am not here as an advertising agent, and have no axe to grind.

The double purpose of these papers may be briefly stated to be that of making a living for their proprietors, and aiding farmers in getting a better living in an easier way from their farms; and I am glad to believe that, as a rule, they are achieving success in both directions, though it is only the latter that need now engage our attention. We will leave the proprietors, for the present at least, to take care of themselves.

"Knowledge is power,"—so is money—only available, however, to those who possess them, and it will hardly be denied that usually the farmer needs more of both. He may obtain his knowledge in two ways—by experience and observation. He who gets it by experience unquestionably has the most thorough of teachers, but the rates of tuition are always high, often excessive, and sometimes ruinous; and a German friend of mine once gave fervid expression to an added demerit when he said:

"Oxberience was a bully teacher. Der only trouble mit him vas dot he gifs his knowledge out ven it vas pooty late."—*New Age.*

The truth is that all our farm knowledge comes through experience—*some one's* experience—but she has an assistant teacher, observation, through whom we can manage to get all the benefits of accumulated experience, and let "some other fellow" bear the expense.

This brings us to the supreme junction of the legitimate, honest, enterprising farm papers, viz: the gathering and collation of the experience of each, and the dissemination of it for the benefit of all; and this is simply widening to the utmost possible degree, the scope of every reader's observation. "They are the public carriers which gather up the knowledge and experience of practical men engaged in farming, and the results of scientific experiments in agriculture, and take them into each farmer's home;" and that journal which best—that is most thoroughly and honestly—performs this office, is the best for any farmer to habitually read, because it is the medium through which he can have the most extended and trust-worthy observation.

J. B. Olcutt, of the Conncticut *Courant*, expresses it, we need our paper to "holler" at each other through, across the States, from farm to farm, and from club to club, or from grange to grange. Farmers do not mingle enough in the public meetings held for the discussion of their industrial affairs, and reading the reports of these meetings is next to personal attendance.

Some one, and I think it was the president of an agricultural college, recently said in effect, that there are four channels for the dissemination of agricultural knowledge: First, agricultural literature; second, agricultural exhibitions, which are, or should be, object lessons; third, agricultural associations, as institutes, clubs, State boards, patrons of husbandry, and so on; and, fourth, the agricultural colleges. It will be observed that he placed agricultural literature at the head of the list, indicating by this order of precedence, its just importance, and I think he was right. The farm papers of the day, if not themselves the great power which is pushing forward the car of agricultural progress, constitute at least the leading medium through which that power is communicated: and I can but wish that the many able and well-equipped men who are conducting them were more able, and better-equipped and greatly increased in number. The task, however, is a weary and wearing one, and I trust that nothing I say will inspire anyone to undertake it. If you do, and six months' experience does not make you just ache to go back to the old farm and grow hump backed picking potatoes, or sore-ribbed dodging the shovel-plow handles along the furrow across a thirty-acre clearing, or lop-sided cradling buckwheat from a steep side-hill, then I have missed my guess.

I should be unjust to myself, to the fraternity of editors of which I am one of the humblest members, and to the occasion which I desire to do a part toward making instructive and entertaining, if I failed to point out some of what seem to me to be weak spots in farm journalism, though in doing so I may call down upon my head the wrath of some whose good opinion I highly value.

The farm paper goes as a rule, into the hands of persons and families who have not been taught in the school of scepticism, and are made inclined to pin unquestioning faith to what they may see in its columns, and act upon its suggestions. Its function is that of an educator, not a purveyor of so-called news; teacher, not gossip; and therefore it should just aim to reach the highest degree of enlightenment upon all subjects within its province, and then be true to its convictions and its readers. This, I am sorry to say, involves the exercise of greater care than is evinced by many in the recommendations and statements which they make. Many of us farmers realize that we need information upon various subjects connected with our work, and we subscribe to and read our farm papers because we recognize them as teachers. "We are eager to learn and we believe what is told us by those who should be authorities, and it destroys our reverence for science and authorities when we find that our papers can not be trusted. When leading journals puff a herd of cattle, or a new strawberry, or a patent hencoop or beehive, because the proprietors advertise, or insert a clipping from an exchange recommending some quackery simply through carelessness, or do anything else to forfeit the respect of their readers, or prove that they are not controlled habitually and all through by an honest, serious, watchful and intelligent purpose, they work untold mischief in many directions."

A more common error among farm papers, and one which does more to obtain their subscription lists and curtail their usefulness than the sin of carelessness to which I have alluded is that they aim too high. It is not well to have high standards; and perfection in farming, as in preaching or in living, will never be attained unless we reach out toward it; but it is not well for our teachers to assume that we are always ready to take the long steps in that direction that they so often recommend. Underdraining, and siloing, and soiling, and "high farming" generally, and even "new agriculture," are all well enough in their way, and in their place; and indeed, I am quite ready to admit that these things all bear their important part in the best and most perfect farming to which we have yet attained; but I submit that they are a long way beyond the reach of the average farmer, and it is discouraging to him to have them continually dinned in his ears, when he knows that under his present circumstances they are as unattainable to him as the moon and her satellites. He knows that he must walk before he can run, and run before he can fly; and he feels the need of a staff to aid him in walking, or of meat to strengthen his loins as he runs, much more than he does of wings, or of angel food. The paper which aims to tell the farmers of large means how he may find good returns from it by investing in their advanced methods will hit its tens; but the one which shows the man who has more energy than capital, and more work to do than he can find means to employ help for, such easier methods of work as will make extra help unnecessary, or how to make a ten dollar bill reach such improvements as will return him a twenty in its place, will bring down its hundreds or its thousands.

It ought to go without saying that farm papers should confine themselves to the work and business of the farm; and while all their weight of influence should be on the side of right, they cannot undertake to be an *omnium gatherum* of all that is useful, or good, or true. The duties of a christian life, and the development of his spiritual being are quite as important for the farmer as for the men of any other calling in life; but if the railway reporter or the shoe and leather dealer are not expected to be the spiritual advisers of the conductors and shoemakers who need them, why should the farmer look to the paper which furnishes him his technical information for the performance of that office toward him? The farmer should, in common with all other good citizens, be a politician in the best sense of the term, but he should not expect to get his political news or instructions from his farm paper. I know there are those who will take issue with me upon this point, and insist that every public question in which farmers are concerned should be discussed in farm papers; but this policy opens the door to a flood of spurious publications which have partisan purposes for their object, and falsely assume the garb of agricultural journalism, only that they may find more ready entrance into the homes, and their doctrines into the minds of farmers who do not suspect their real purpose. Farm journalism is not exempt from the doctrine taught in the old saw that "the shoemaker should stick to his last," and the maxim that instructs us to "do one thing at a time, and do that well" "The true mission of the agricultural paper is to help the farmer" *in his business*, and to that it should confine itself, leaving his morals and his sports, his religion and his politics, his belles letters, his music and his art, to be cultivated and looked after by journals whose editors are schooled and trained in their specialties. Whatever may be said for the general-purpose horse, or the general-purpose cow, or even a general-purpose pig, a general-purpose paper, no matter how meritorious soever it may be, does not fill the bill for a true farm journal.

The weakest point, however, of the great majority of farm papers, even of the honest and well meaning class, is to be found in the advertising columns. I am telling no trade secret when I say that these are the very life blood of at least ninety-nine hundredths of all periodical publications. In some cases the subscriptions will scarcely pay for the ink and white paper upon which they are printed, and the temptation to admit to their columns announcements which are not above the suspicion that they may lead the unwary into questionable expenditures, or have an undesirable influence upon the minds or morals of their readers, because those who offer them can afford and are willing to pay large fees, is certainly great.

In addition to this, even editors of farm papers, of whom more is expected than of any other class of men on this footstool, are not infallible, nor are they capable of being always on guard, and it is by no means impossible, nor indeed uncommon, that wily scoundrels who seek access to the public eye and ear for swindling purposes, succeed in undermining the intelligence, and evading the watchfulness of even the most intelligent and watchful of editors, and by hook or crook, use his columns for spreading their uncanny wares, and inquitious schemes before the confiding farm reader. In this particular, however, the agricultural press is cleaner and better than many others, not excepting some so-called religious publications, and the evil is tending rapidly to cure itself, because the wise and cautious editor has aids in that wise and cautious class of advertisers whose patronage is most desirable, and who look as much to the character of the paper and its readers, as they do to the extent of its circulation.

But since I have not hesitated to criticise, and point out some of the errors and failings of farm papers as they are, it may be expected that I should show what I think they should be:

The ideal is seldom, perhaps never, reached, and it is quite possible that the perfect farm paper will never be published. When it is, if ever, it will be a better and, in the best sense of the word, a greater, paper than the world has ever before seen. Its capital will be sufficient to make it regardless of public favor, when public favor is only to be won by catering to false opinion or absurd prejudice. Its editor-in-chief will be a man of the biggest brain, the most comprehensive views, and the best educational equipment obtainable; while his associates and subordinates will all be specialists in their chosen branch of farm knowledge, and numerous enough to cover all the ever-widening circle of practical farm work. Its contributors will deal in facts, not theories, and report their blunders and failures as faithfully as they do their successes: and no one of them will be allowed to grind his axe until the editor turns the grindstone. Its business manager will be more solicitous to keep faith with its readers than to extract the last possible dollar from its advertising space; and finally, its subscribers will all pay in advance, and renew their subscriptions, "write at least one new name in addition," without solicilation or reminder, either by circular, label, "blue pencil mark around this paragraph," or otherwise. Perhaps the agricultural millenium will have dawned before the perfect agricultural journal shall have been founded, and it is some consolation to know that in that case it will never be needed.

But it is a good rule to accept the world as we find it, rather than undertake to reform it to our idea of what it should be, and we will apply the rule to farm papers, and comfort ourselves with the fact that they are now, for the farmer, the better class of papers published, and that even accepting the ideal which I have described as the standard, they are better to-day than they have ever been before, (with lots of rooms for improvement), and the better class of them are making steady and rapid advancement in the right direction. They are more ably edited, better illustrated, and have many more and much better informed contributors than ever before. Specialists in all departments of farm knowledge and farm practice are paid contributors to their columns, and the experience of the very best farmers throughout the world is sought and published; creating a vast and rapidly accumulating fund of the best information, that can be had nowhere else, and that proves a reliable aid to the thoughtful and careful farmer. Again I say, farm papers were never before so practical, never so trustworthy, never so useful as to-day. Though none are infallible nor without error, many of them are grandly accomplishing their exalted purpose, and deserve even greater success than they have yet achieved. Some careful reader has truly said: The best thought of the country upon farm topics is found in their pages, and if some chaff goes with the grain, we must not forget that divine wisdom has made editors imperfect.

I wish that I knew who he is, that in the name of the fraternity I might thank him for the easy way in which he lets us down.

So far we have considered the farm paper from but one of its sides; let us turn it over; I have sometimes thought that the readers of a farm paper are more important to it than its editors; and I am very sure that many an editor is more faithful to his readers and their interests, than the readers are to the paper and its interests. The accurate and painstaking editing of a paper may be the first essential to its value as a farm help; but certain it is that unless intelligently and faithfully read, and its good counsels put into wise practice, the ablest writing and most painstaking editing can avail nothing. One of the best of Iowa's many good farmers, in writing of this matter, says:

"In too many instances the paper fails to accomplish what it should because the reader fails to heed its counsels. Farmers read an account of some experience which seems reasonable and is probably recounted with accuracy. They follow an argument in favor of a given practice and assent to its force. But at this point they stop. They do not try to repeat the experience They do not put what they learn to practical use. They admit the value of what is presented, but through carelessness or force of habit adhere to the old ways. Of course we should not accept as gospel everything we read. But is it not true that we too often fail to do as well as we have been instructed to do? Is it not true that we might be better farmers if we gave closer heed to the counsel of the best agricultural papers?"

Certainly every subscriber to a farm paper owes it to himself that he should make a wise and judicious use of all that may be useful in it; and in doing this he is only fair to the paper itself.

One of the best methods of utilizing to its fullest extent whatever of value farm papers may contain, has but lately come to my observation. It seems to have originated with the Westtown Farmers' Club of Orange, N. Y., and is that of reading extracts from them at the club meeting, by some one previously appointed to select, followed by comments, discussions and criticisms. This plan is to be highly commended. It will tend to develop and correct whatever of error the paper may have promulgated, give the right and true that thorough digestion that will make it most useful, and bring out new facts from the experiences of the male members, more valuable, perhaps, than the original article that drew them forth. Indeed I am very sure that if a report of the discussions and criticisms could be forwarded to the editor of the paper criticised, it would be gratefully received, and tend toward improvement.

The literature that applies to the life-work of the farmer, whether it be periodical or in book form, is of quite as much importance to him and his success, as is that of any other calling, profession or industry; and he is only just to himself when he reads, studies and digests it, and assimulates so much of it as he finds suited to his needs. He would not be considered a wise farmer who would purchase an implement or piece of machinery for the better prosecution of his farm work, and then neglect or refuse to make the least possible use of it, because in some part it proved to be a little less than perfect, or not quite adapted to all his needs. I do not believe that I run any risk of contradiction when I say that a good, honest, carefully conducted farm paper is the very best implement that any farmer can buy for the same amount of money, and he ought to take out of it all the good there is in it. A farmer writer in one of New England's best farm papers says: He thinks a good agricultural paper the best warrant of success a farmer can have. It pays the highest rate of interest of any investment and declares the biggest dividend."

But there is still another duty which every good farmer owes to himself and his brother farmers, which can best be performed through the medium of the farm paper. It is embodied in the scriptural injunction "To do good and *communicate* forget not," and this duty he owes to the paper as well as to himself.

Some of the most successful farmers in America never wrote a line for their farm papers, and these are the very men who ought to begin. There are plenty of men who can write better than they can farm, only are failures at their own business, but magnificent in their success at letting other people know how to run theirs. Of them we have a superabundance, and they need no encouragement. But to the successful farmer I say write.

This is a reciprocal world, "If we would receive, we must also give. Interdependence is a better word, sometimes, than independence, and if we demand helpful information from our farm paper, we must make return in kind, if we have it at our command. I have said that "the supreme function of the farm paper to the gathering and collating of the experience of each, and the dissemination of it for the benefit of all," and how, pray, can this be properly performed if each man's experience and knowledge of useful facts is kept carefully sealed up in his own head?

The one great financial problem of the day, for each individual, as much on the farm as in the store, the factory, or the shop, is how to get the best possible returns for capital invested and labor employed; and the solution of it is found in the intelligent use of all accumulated and obtainable experience in our particular calling. It can only be accumulated by each one's contribution to the sum total, and in view of this can any good farmer who knows how to write say there is not a duty resting upon him to communicate the lessons of his experience to others who need instruction that will open the way to better returns.

Therefore write, whenever you have a new fact or useful experience, but write *only* facts; never mind theories. One "I know," is worth an hundred pages of "I guess." Farming is the last business in the world in which an undeveloped theory is of any practical use. If you have a plausible theory, run it through the mill of practice until you have either exploded it or ground it down into a hard fact; then fire that at the editor, he will thank you. Mere theories, undetermined, are even worse than good intentions, and you know they are said to be used only for paving material in a certain locality in which good farmers are never found, and which is too hot and dry for farming operations if they were. But do not forget, nor neglect this duty of telling the editor of your favorite farm paper any good thing which you are sure you know; and thus constitute a real missionary.

Now, if I have criticised the editors of farm papers, and dictated to their readers, quite as much as either class will probably bear, there remains that class who do not subscribe to nor read any farm paper, to whom, perhaps, I might read a lecture with still more show of reason, but I forbear. It would be a waste of words and time.

You may have such in your county, and even in your immediate neighborhood, but they never attend institutes, nor grange meetings, nor farmers' clubs, excepting the impromptu sort that gather at the store and blacksmith shop on rainy days, and are safely out of range of anything I might say here. There are evidently none such in this audience.

In conclusion let me urge, that, as a rule, farmers give to the farm papers, falling short of perfection as I admit, even the best of them do, an increasingly kind consideration. They are doing more for the elevation and progress of farming, the uplifting of farm life in all directions, and the enlightenment, advancement and bringing out of the farmer and his family than all other agencies combined. It may be years before the "bright-minded, well-mannered, cheerful-hearted, healthy-bodied" farmer, who shall think right, and be right, and do right, because he knows the right, and has the courage of his convictions, shall become as much the rule as he has, until recently, been the exception; but that time is coming just as sure as the years roll around, and just as fast as the farm papers can bring it. It is to be regretted that every farmer does not bear a stronger hand in hastening its advent by subscribing for from two to a dozen, as his needs may require, and trying as assiduously to increase the productive power of his brain by use, as he does that of his farm, by the use of improved, though yet imperfect, implements. It is a stated outpouring of the experiences and practices and knowledge of scores of good farmers, from widely separated sections of the country, who have been at some pains and trouble to put what they have learned within your reach. It comes to your own home, awaits your own leisure and convenience, and then sits down with you by your own fireside, to unfold whatever of knowledge it may have that will be useful to you, without boring you or talking you to death. If you are not interested in the first subject it proposes, you may change to another, and it will quietly acquiesce; if you are so confirmed in your own opinions that its expression of opposite views makes you angry, you may cuss away at it without fearing a quarrel, or that it will "jaw back;" if you get a useful point or a fresh notion, you may adopt it as your own, without being accused of imitating your neighbor in your practice; and when, finally, you become sleepy and tired, you may summarily dismiss it, or even throw it down in disgust, without danger of hurting its feelings, or fear that it will not call again. The good farm paper is the best friend that the good farmer can have.

THE ACQUIREMENT OF MANUAL SKILL IN FARMING, WITH SPECIAL REFERENCE TO FARMERS' BOYS.

By Prof. S. R. Thompson, *Westminster College, New Wilmington, Pa.*

[Read at Warren meeting.]

The occupation of a farmer though not called a *trade*, has many resemblances to it. A tradesman is one who follows some business in which he uses skill of hand with more or less intelligent direction. The different things a tradesman or, as he is often called, a mechanic, has learned, or is required to do in the prosecution of his trade, are often called arts. For example, a carpenter practices sawing, boreing, mortising, planing, and so on. Each a distinct art and which may be learned by a person who knows nothing of any other of them. So a blacksmith learns to make a forge fire, to heat iron, to draw it, to upset it, to shape it, to weld and so on. A machinist learns to chip, to file, to scrape, to turn, to bore and the like. Now the tradesman who can practice the greatest number of the arts belonging to his particular calling, in the best way is the best mechanic. Of course there are other things to be learned and known by a successful tradesman or mechanic besides these named arts, but when one has mastered the arts, he can very soon learn the corresponding trade.

Now it has seemed to me that the revival of farming, which has led to large numbers of such meetings as this, should, among other beneficient results, create a greater interest in the art of farming, and stimulate the young men now on the farms to take more pride in their occupation, and more delight in the exhibition of skill in them. And farther, I have thought that we might classify the work of the farmer, by singling out the fundamental arts which he must learn and practice. Without attempting an exhaustive classification, I name, not in any special order, but just as they occur to me, the following:

1. Adapting harness to a team or horse.
2. Hitching up a team.
3. Driving a team.
4. Adjusting and holding a plow.
5. Setting up and adjusting a mower.
6. Grinding a mower knife.
7. Planting a tree.
8. Grafting and budding.
9. Judging as to the merits of horses, cows, steers, sheep or other domestic animals.

Many more might be enumerated, but these will answer my present purpose.

Before speaking in detail of any one of these, let me ask your kind attention to some more general considerations which will make my meaning plainer.

Industrial arts take rank in public estimation according to the amount of brain-work needed in their successful pursuit. An employment which needs only muscle, ranks low; one that requires more intellectual ability ranks higher. Compare the hod-carrier, the bricklayer, and the architect. All of them are needed in the construction of such a building as this; but how different their standing in public estimation. How different their compensation.

This explains the low estimation in which many persons hold the business of farming. The fact is that the business of farming rationally carried on, is one of the most complicated and difficult of all occupations. And it is as certain as anything can be that an educated and intelligent farmer, other things being equal, will make a better farmer than one destitute of this endowment. Why, progress in farming is wholly the work of the intelligent educated farmers. Show me a country where the farmers are generally ignorant, and I will show you one where there is no progress. The farmer of some parts of India, to-day, as for the last thousand years, scratches the earth with a crooked stick for a plow, with a team composed, perhaps, of his wife and a donkey.

The ordinary course of progress in the industries, is for the workmen of one generation to practice the arts which were struck out by the more enterprising of their class in the preceding. When stopping for a few days, not long ago in the rural neighborhood where my time till manhood was spent, and where my first lessons in farming were taken, I found the farmers following very many methods which were advocated thirty-five years ago in the agricultural papers of that date. Whoever attentively studies the changes in farming in the last fifty years, will find them to be principally in three lines. *First*, better stock; *second*, machinery more largely used and of a more complicated kind, and, *third*, a more extensive use of artificial fertilizers. My illustrations will be from the first two.

Domestic animals kept on the farm are immensely better than those of fifty years ago. Our modern beef animals, mature earlier, furnishes a larger quantity of flesh in proportion to offal, and this flesh is of a better quality. The modern animal will lay on more flesh from a given amount of food than did his progenitor of fifty years ago. Now the first point to be noticed here is (1) that this improvement has been made by intelligent attention to the laws, which regulate the improvement of domestic animals. It was not done by main strength and awkwardness," and (2) that the same intelligent skill which produced this improvement in the breeds of domestic animals, will be needed to keep it up. High-bred, early-maturing domestic animals, are to some extent an artificial product, which ignorance or neglect will soon overthrow. This skill which serves to produce or maintain a high standard of excellence, cannot be gained by routine or repetition. Nothing short of trained intelligence can be counted on as a basis on which to build it. Every observant man in this audience must have seen instances which illustrate the truth of this.

The second change in the farming situation, is the increased use and greater complication of farm machinery. Some of you can remember when the sickle was superseded by the grain cradle, which in turn gave way to the reaper and it in turn seems likely to be superseded by the self-binding harvester.

A similar rapid change has been made in methods of cutting grass, of planting and of cultivating corn, and of other agricultural arts. No argument is needed to prove that it requires more knowledge and greater skill to manage a self-binding harvester than a sickle.

A steam thresher and cleaner cannot be handled with as much simplicity as a flail. Skill in the use of the sickle or the flail may be acquired by dint of mere routine and practice. But to master the self-binder or the thresher requires something more than this. Not a few men with limited intelligence and no knowledge of machinery have invested money in these complicated machines and found themselves at the end of a season the owner of a wrecked machine and of a greater or less quantity of dear-bought experience.

One who uses a complicated machine with profit must be prepared to meet emergences as they rise, to adapt means to ends, to see the way out of unexpected difficulties, all of which need a cultivated intelligence.

Recurring to the lists of agricultural arts spoken of, we may briefly note the importance of skill in some of them. A badly-ground mower knife exhausts the team and wears out the machine faster than one well ground.

In dropping corn with a planter, or marking out the ground for planting, if the driver makes a straight row the corn can be worked much better and more quickly than is possible with crooked rows. I once had a farm-hand in the west who with a two-horse planter and rope dropping attachment, planted sixty acres of corn in four days, fifteen acres per day. The next year a man equally willing and much stronger, using the same team and planter, was able to plant on the average but eight acres a day. The difference came from the superior skill of the first over the second. But the greater amount planted was not the only difference. The work done by the first was much better, the rows made were so much straighter, that in working the corn the first time with a two-horse straddle row cultivator, it was possible to get over more ground and do the work better than in the second case.

I have seen five minutes adjustment of a sulky plow make it run one-horse lighter. If the bearings of a machine are too tight they heat, wear too fast, and are harder on the team; if they are too loose the power needed to run the machine is greatly and unnecessarily increased, and the machine worn out faster. This is specially true where a reciprocating motion is converted into a circular, or the reverse.

At a trial of harvesters once in the west, I noticed a little man with a monkey wrench in his hand following one of the machines all the time during the trial. On inquiry I found that he was the master mechanic of the shop in which the harvester was made, and that he had been sent 600 miles to see to it that the machine did its best.

As a rule farmers do not appreciate the value of attention to the finer adjustments of a machine to its best working. But this large manufacturer understood it, and sent his skilled mechanic 600 miles to see that his machine was in the condition needful to appear to the best advantage.

There is much, too, in adapting a machine to its work. At the plow trials in New York some years ago, it was found that in the same soil, with the same team and plow, the draft as shown by the dynamometer was twenty per cent. more with an unskilled man at the handles than with a skilled man.

It is not difficult to see the great advantage which a good judge of stock has over one who is not so skilled. In either buying, selling or breeding, the unskillful is at a disadvantage. It will be noted that skill in judging stock requires two things: First, a knowledge of what constitutes a good animal of any kind of breed. Second, the power to remember and recall forms, so as to compare a present animal with one absent, or an ideal animal which is carried in the mind and by which others are measured. Now what can be done to promote the acquirement of greater skill in the arts of farming?

First. See to it that our public schools are managed in such a way as to promote intelligence, not mere scholastics.

The great aim must be to cultivate a love for real knowledge, a taste for reading, and such early facility in acquiring knowledge from books and periodicals that reading may be a pleasure rather than a task. Nothing can safely be allowed to take the place of this.

Second. Among the school acquirements which will be of special value to the farmer's boy, I place free-hand drawing. This is the one thing now seldom studied in country schools which will be of special use to the farmer.

To judge stock, a trained eye is needed, an eye trained to appreciate differences of form, and to remember them. No other study will do this so well as drawing, and this application of it alone will amply justify its study by pupils in our county schools.

A clear knowledge of the elementary principles of mechanics, of the laws of force and motion, of friction and the like, which are constantly applicable to the ordinary work on the farm. A farmer comes near to nature all the time, and is dealing constantly with her laws. His skill consists in taking advantage of the laws of nature which increase products, to secure as large a share as possible of those products.

There are a hundred ways in which a knowledge of natural laws will make a man a better farmer.

To be sure no one can farm at all but by taking advantage of the operation of natural laws—but it is one thing to know these laws, in their single applications, and another to have that broad comprehension of them which enables one to take advantage of all the openings which may arise.

Boys should be early taught to do all kinds of farm work and to take pride in doing it well. When there are two or more boys in the same family, a little wholesome emulation will keep.

Especially should boys be encouraged to study machinery, and the points of stock. For the latter, nothing is better than to give the boys some pecuniary interest in some kind of stock, and let them try their hands sometimes in purchases. When interest is thus secured, a good book treating on stock, put within their reach, will be read with attention and profit.

State and county fairs might do much in this direction, by offering premiums to young men for skill in the manual arts of farming. Suppose at your next county fair, you offer a premium to the young man under twenty-three who will grind a mower knife in the best manner and in the shortest time; or one to him who will take a mower apart, clean it up and put it together again most quickly; harness and drive a team most neatly; plant a tree in the best manner. Might not some of the surplus energy of our young men be in this way diverted from strife on the base ball ground, be turned to a more useful and profitable employment?

THE EDUCATION OF FARMER'S SONS.

By ISRAEL GARRETSON, *Member from Adams, Biglerville, Pa.*

The subject to which I have devoted a few thoughts, viz: "The Education of Farmer's Sons," is one that demands the earnest attention of the farming community in general.

Yet we scarcely know what to say that will bring forward the best results. In the first place, much of the opposition of farmers to educating of their sons beyond a certain limit, comes from the prejudice which those men have towards education, as the term implies, feeling that if they educate their sons, it will unfit them for the duties of the farm and make them indolent and restless under the restraints of the farm.

Many farmers now fail to take advantage of the minimum school term, thus failing to secure the advantage intended by the law. They keep their boys out of school from one-third to one-half the time, under a plea of the most false economy. The reason why so many boys leave the farm, is that there are no incentives to keep them there and the consequence is that the father must cease farming or be at the mercy of negligent and mercenary parties to do it for him, which is too often the case. Men who work their boys from sunrise to sunset, yea in many instances till after dark, will eventually find them dwarfed physically and mentally.

What we want for our sons is, that whilst they shall eat bread by the sweat of their brow, that they shall at the same time be able to mingle with educated society and in educated assemblies, and feel that they are able to cope with their peers when there.

"Teach them that knowledge is power, the philosopher's stone that turns everything it touches into gold; it is the scepter that gives us power and dominion over nature, the key that unlocks the store house of creation and opens to us the treasures of the universe."

Our sons should be taught the work of the farm, to know how to adjust all kinds of machinery that they have in use, that from the sound of the machine they can detect a loose bolt, and at once point it out, which often times if neglected causes loss of time and expense for repair. They should be taught to be kind to all animals; to study the habits and dispositions of every animal that is reared on the farm; to learn the secret of training the most vicious to become docile.

But the education of the mind and heart should not be neglected. Each father should feel that his sons should have the full benefit of the district school during the term. That there may be institutions established in each county so that they may acquire a knowledge of chemistry, natural history, natural philosophy, book-keeping (single entry), works on diseases of the horse and other animals, together with the anatomy of these animals. These will enable them to perform his duties more successfully when called upon so to do.

And to this end training schools should be opened in each county for this purpose alone; to receive appropriations from the State upon the same basis as our normal schools for teachers. Whilst the boys are at home they should be given periods for study, and should be encouraged to do so. Books and pamphlets on various subjects of general information should be placed in their hands.

Works on farming should be read and studied by them and a high stand of cultivation should be aimed at. Then they should be treated in a kind and forbearing way, praised for their faithfulness and given at times pocket money as a reward for their industry. They should be encouraged in business habits; in habits of thrift and industry. If they have a desire for birds encourage them in the undertaking; give them a calf or a colt to rear so that they may have something to call their own; when the animals get old enough to sell, allow them to dispose of them, instructing them on prices and how to effect a sale, allowing them to have care of the proceeds.

Give them a piece of land, telling them to make out of it what they can and letting them know that the proceeds shall be theirs. They should be thoroughly trained in the uses of money. Should be trained from early youth in honesty, sobriety and virtue.

Literary societies should be encouraged in rural districts, and the farmers' sons should be encouraged to take part in them, as they teach them to think. They should be allowed to attend farmers' institutes and take part in them when convenient. The nobility of labor, the dangers of the cities and towns to the moral well being of a boy from the farm, should be impressed upon them in early life. Then, too, the quiet life which farming brings to its possessor, with its freedom from the rush and hurry, and wear and tear, of the active business world, should be vividly portrayed. There the beauty of being with nature and nature's God, with his beautiful sky above and the verdant grass and lovely flowers beneath, with the songs of birds, and the buzz of the busy insect world, calling to bless and praise the giver of every good and perfect gift, should be pictured in all its beauty. All this must come in a boy's education, and if properly pursued less of the leaving of the farm would be heard and less of the irretrievable ruin, which is often brought upon noble young boys, would be heard in our records of crime and degredation. But unless some reform of this kind is begun they will still leave the farm. Tired of the drudgery of the farm, of the tyranny of the home, of the grudging of the most innocent recreations, they launch forth into the unknown sea of the world and too often make shipwreck of themselves, not being willing as the prodigal of sacred writing to return to their father's house, knowing as they do that they would fail to receive a father's blessing. But what must be done to bring about this great reform? Much can be done in farmers' meetings. This subject should frequently be brought forward and frequently and freely discussed. False economy must be laid aside, and this great subject allowed to have full play. What course are farmers pursuing to-day? As we have said, they fail even to take advantage of the benefits accruing from our glorious free-school system, and keep their boys working when they should be in school. They fail to allow them to enter at the beginning of the session, and when they do go, they are so far behind they become discouraged and fail to take that interest, which they otherwise would do, if allowed to enter at the beginning of the session. Many are not allowed to go until the weather becomes so inclement that they can no longer work. Then very frequently parents speak prejudicially of education in its broad sense, thereby prejudicing the young and susceptible minds of their sons against their mental development. Then in regard to the county school hinted at, we believe such an institution would do much good. Our State college is too far off for many. The expense of travel is an item; but if a school could be opened in each county, which would be open through the fall and winter, and the students allowed to go home on Friday evening and return on Monday morning much of the travel to a State college would be saved. If the money expended on a State institution was divided among counties, such schools would do a vast amount of good. Let the farmers look seriously at this question. Let them arouse themselves to the importance of the subject, and not only think but act; let petitions be sent to the Legislature for such schools. Let their be advantage taken of the minimum school term.

Let books and periodicals be placed in the hands of the farmers' sons, and a new era will dawn upon the life of farmers, which only the future will unfold.

FARMS THE STRONGHOLD OF AMERICA.

By JAMES MCCRACKEN, JR., *Member from Jefferson, Frostburg, Pa.*

This is true when viewed from many standpoints. In numbers the farmer surpasses not only any other occupation, but all others combined. In area, the farms cover almost the entire continent. In valuation, farms may be counted in dollars whilst many other industries are represented in dimes and pennies. And the food supply for our own country and many people abroad, finds its origin in the grain and pasture fields of America.

On the first of April of this year the farms of the United States were carrying 49,234,777 head of cattle, 43,505,025 head of swine, 43,544,755 head of sheep, and 13,073,936 horses, less the number at work upon the roads and in the cities. The great mills which manufacture all our woolen goods must look to the fields for their cotton and wool.

Let us for a moment in our imagination withhold the products of American soil from the channels of commerce and note the effect upon the industries of our country. How quickly would the great centers of trade be out of business. Manufactories would languish and die; grist mills would be idle; slaughter houses and stock yards would be without their daily supply of fat stock; our tanneries would have nothing to do; the thousands of men who are now peeling bark and manufacturing lumber would be looking for other employment; there would be worse than a ten per cent. reduction at the coal mines; our great trunk railroads would not need their striking engineers, and nearly half the people of our country would have nothing to do, nothing to wear and nothing to eat.

We have drawn this picture to show the dependence of all classes upon the products of the soil, but we do not for a moment presume that farmers can live and prosper independent of the other industries we have mentioned. Demand and transportation are as important as production and supply. One cannot prosper without the other. Hence their interests are the same, and a mutual and friendly feeling should exist between them.

The influence of country life upon the moral of society is an item we should never lose sight of. On the farm our boys and girls are protected from the influence of a thousand vices which are always to be found in cities and towns and about all public works. They are largely under the care and influence of their parents, where their minds are imbued with that which is good, and are shielded from much that is wrong; and this early training will always go with them into whatever occupation or station in life they may be found.

The healthfulness of our occupation is also a matter of great importance. We may watch the little child, from the time it begins to creep over the porch in the morning sun and pure balmy air of the country, through the different stages of life—when it plays in the back yard, on the road side or in the gutter; when it runs errands for its parents, or when it is able to take an active part in the labors of the field, the household or the garden, and we find in every movement a tendency to develop a strong and healthful physical nature. And, since the mind is always in sympathy with the body, it is easy to explain why so many of our great men in every profession can look back with pride and pleasure to their boyhood days upon the farm, where the foundation for a great and successful career was laid, unknown alike to themselves and to their parents.

Socially the farmer's life is to be envied by all classes of people. This is especially true in every locality where our people have had the advantage of organization—where societies of any kind have united farmer families in fraternal union, and especially in that great queen of all farmers' organizations, the " Grange," which has bound together with one golden cord more than a million tillers of the soil, who every week met in their grange halls for social, intellectual, moral and financial improvement.

In cost of improvement our farms are not equalled by any other business. The fences alone upon American farms have cost more money than the buildings in all our cities and towns combined. One yearly crop upon our farms is worth money enough to buy our great cities of wealth, grandeur and business and convert them into potato patches. The cities can boast of lager beer saloons, gambling houses and dives of corruption, whilst we point with pride and honor to our churches, school houses and grange halls upon every hill top. They may talk of their great vaults of accumulated wealth, their electricity, and boodle aldermen, while the farmers reveal in robust health and the untainted breezes of pure country air, raising the bread that feeds the world, and paying the most of the expenses of government for themselves and their city friends as well.

When we come to measure our military strength, "The homes of a nation are its strongest forts," and since more than half of our homes are upon the farm, the farmer's home must represent "The stronghold of America." The influence, the surroundings, the whole nature of the farmer's life qualify him to be our country's strongest friend. Past experience has proven this to be true. Who would dare to charge the American farmers with disloyalty or cowardice at a time when our flag has been in danger? They have always been among the first to the front; and have proven themselves the most unswerving and uncompromising soldiers. If our country were divided into farms of forty acres each with an owner and his family living upon each farm and tilling the soil with his own hands, surrounded by the comforts and luxuries which farm life ought to afford, we would have a standing army which might defy the world to penetrate our territory. And they would always be ready to resent any insult to themselves, their families or the country that gives them homes and protection.

And who would question the fact that upon these farms, surrounded by their families and everything intended to endear them to home and country, our young men would be happier, more contented, and safer from harmful influences, than if they were enlisted in our regular army and stationed in one of our military forts, which have proven to be hot-beds of idleness, corruption and sin to many of our country's brightest boys, who, had they been kept upon the farm, might have been happy, useful citizens, helping to increase the wealth and prosperity of our nation in time of peace, and been just as good soldiers when needed in the field of danger?

There is yet another sphere in which the farmer represents "The stronghold of America," to wit: at the ballot. This is the grand lever with which all our wrongs may be avenged. This is the great sword placed in our hands by that God-given idea in our national constitution: "All men are equal." This is a power we have a right, and, Heaven knows, we have occasion to use. Honor to ourselves and duty to our children require and demand that we arise as men worthy of the calling we represent, and the age in which we live, and wipe from our statutes those accursed laws which burden down the American farmers with five times their rightful share of taxation, and a hundred other discriminations which are annually sweeping away our homes by the hundreds into the hands of cold and heartless corporations, both at home and abroad, compelling ourselves, our wives and our children to become serfs and tenants upon the lands which are ours by birth-right, and should be handed down to our posterity, so long as we continue to be the wealth and bread-producers of the nation.

THE PRINCIPLE CAUSE OF BANKRUPTCY AMONG FARMERS.

By Hon. L. E. ATKINSON.

[Address at Mifflintown Institute.]

The topic selected is one that has been brought prominently to the attention of the people of our county by the fact that a number of our best farms have lately fallen under the sheriff's hammer, while many farmers are suffering from financial embarrassment which may end in the sale of their lands by the same officer. Inquiry is properly made of the cause of this, for the intelligent man always seeks to remove the cause, in order to escape from an injurious effect. If the causes of financial failure amongst farmers can be determined and removed, if removal is possible, or their consequences evaded, this distress may be relieved and the prosperity of former years be restored. In entering upon this inquiry it will be important to ascertain whether the causes of financial failure amongst the farmers of Juniata county are for reasons that are personal to those who have failed, or are now embarrassed; whether these causes are local, operating only on our own citizens, or whether they are general and affect all agricultural communities producing the same crops and raising the same animals that we do, under about the same circumstances. If the reasons for failure are personal to the embarrassed farmers, you need no address from me to point them out. You are acquainted with these men, and know them more intimately than I do, and your observation would enable you readily to avoid any mismanagement of which they might have been guilty. But most of those who have failed have been skillful farmers, men bred to this occupation, who understood it thoroughly and who have been economical, industrious and attentive to their farms. Estimable citizens to whom our sympathies go out in their misfortune, and whom we all believe deserved success. If their toil was unprofitable it was apparently not their fault, and in view of our knowledge of them and their families, we must dismiss the theory that the financial failure of these men is due to any reason personal to themselves. Are there local conditions operating to the injury of the farmer? It seems not. Our farms are cultivated with intelligence and skill, their productiveness has not been diminished by the exhaustion of the soil, fertilizers have been used, generally with good judgment, and more attention seems to be given to the details of farming than ever before. There is a marked contrast between the farms of Pennsylvania and those of many other States. If our farms are compared with those of other places they will not suffer by the comparison. A few years ago I visited Mount Vernon and found that many of the fields cultivated by the immortal Washington were grown up with briers and bushes, while those still under cultivation and not owned by the Ladies Mount Vernon Association, were exhausted and seemed to be little more than an unproductive mass of white sand. Soon afterwards I passed through the Cumberland Valley and there saw land which had been cultivated for more than a century and which now produces better crops than ever before. My observation of the land in our own county convinces me that it is in better condition and more productive than at any time within my knowledge, except in a few instances where careless and inefficient culture has done its work, leaving its mark in short crops and bramble-covered fields. If neither the producing power of our lands, nor the skill of the husbandman has abated, we must look to other than local causes to account for the financial failure of our farmers. And when we allow our vision to range over a wider field, we find ourselves confronting conditions that are amply sufficient to account for the financial difficulties of our people. If I had told a farmer of Juniata in 1864 that a canal was being constructed across the Isthmus of Suez, the intelligence would not have excited any particular apprehensions. He would probably have told me that he had read of the enterprise and he would have discussed the engineering difficulties in the way. Perhaps he would have said that it was nothing new that Herodotus described a canal across the Isthmus and that Pliny stated its dimensions as 92 miles long, from 108 to 165 feet wide and 30 feet deep; that it was made about 600 years B. C., and that it had been filled up with the drifting sand of the desert, and he might further have said that it was restored by Trajan in the second century A. D., only to become unusable from the same cause. He might have added that the history of the two previous attempts had shown that a canal could be made, but they also showed that it could not be kept open. But the steam dredge was unknown in the days of the Pharoahs and of Trajan, and with its mighty power, even the drifting sands of the desert might be defied. On the 17th of November, 1869, the Suez canal was opened for navigation. It is one hundred miles long and it opened a new epoch in the commerce of the world. Previous to its construction a voyage from Liverpool to India and return occupied six to eight months, after its completion the voyage was made in six to eight weeks. The long voyage around the cape of Good Hope need no longer be made, but a voyage through the Mediterranean Sea, the Suez canal and the Red Sea brought Europe as near to India as to America. The shorter route to India which Columbus sought to discover had been *made*, not *found*. The Northern Pacific railroad began to push its way from Duluth at the head of Lake Superior into the almost unknown region which lay between that point and the Pacific. Little attention was given to it, we regarded it as a wild and likely to be unprofitable venture for its projectors, and when, in 1873, its financial agent, Jay Cooke, succumbed under the weight of the burden imposed upon him, and his great fortune was lost in the disaster, no one was surprised. The wisest of our people shook their heads and some who esteemed themselves wiser than the rest said "I told you so, that railroad never can be built." But the Northern Pacific railroad *has* been built and travelers and freight are transported from the Pacific to the lakes, over a good roadbed, upon fine cars, with speed and safety.

The Canadian Pacific with immense land grants and Government aid skirts our northern border having been completed within a year, and I was surprised lately when a young lady, formerly of our town, told me that she had come from her home on the Pacific as far as Winnipeg upon this new Canadian railroad. It has entered into active competition with our own roads to the Pacific and invites traffic by lower rates than our railroads have heretofore charged. But you will ask, what have the Suez canal and the Northern Pacific and the Canadian Pacific railroads to do with the financial failures of the farmers of Juniata. I answer they have had much to do with the existing depression amongst farmers. Our wheat has been the crop of all others upon which our farmers relied to bring them money and when the price of this cereal is much reduced farming becomes to this extent unprofitable. The Suez canal and the railroads I have named have opened up vast wheat producing areas in which wheat can be grown at less expense than upon higher priced lands, and the wheat producers of the older States now find themselves confronted with new competition for the wheat markets of the world In an estimate made of the wheat crops of the world the statistician of the department of agriculture figures the crop of 1886, as follows:

United States, ...	457,218,000 bushels.
Canada, ...	37,219,234 bushels.
India, ...	258,317,632 bushels.

Before the completion of the Suez canal not a bushel of wheat found its way from India to Great Britain. In 1884 Great Britain imported 29,550,000 bushels from India, and in the first two months of 1887 she imported 18,748,921 bushels of India wheat and only 10,933,616 bushels of wheat from the United States. The export of wheat from India in 1872–3, was 537,035 bushels, but in 1885 it exported 39,312,000 bushels. Australia and New Zealand increased their exports from 14,000,000 bushels in 1880 to 19,466,000 in 1885, and the Argentine Republic from 5,772 bushels in 1881 to 3,986,000 in 1884. This enormous increase in the export of wheat from India, is due to the construction of new railroads at government expense or with government guarantees, and the cheap freights to Europe occasioned by the shortening of the route by passing through the Suez canal. It is the supply of India wheat that has chiefly caused the great fall in price in Great Britain during the last few years. The agricultural laborers in India are content with wages of from eight to nine cents a day, and many of them can live on rice at a daily cost of less than two cents. If the great increase in the quantity of India wheat keeps up for ten years to come in the ratio it has during the last five years, this product may possibly find a market in the seabord towns of the United States, notwithstanding our duty of twenty cents a bushel on wheat.

It is true that American agricultural implements and machinery may accomplish a great deal, but there is nothing to prevent their exportation to India. The policy of paying such wages as eight or nine cents per day to men willing to feed on rice at a cost of two cents a day is, however, something that cannot be transferred from India to the United States. The vast increase in the acreage sown in wheat, which has been opened up to settlement by the Northern Pacific and Canadian Pacific railroads adds still more to our annual wheat supply. In 1886 Minnesota produced 42,856,000 bushels of wheat, while Dakota which in 1879, is credited with only 2,830,289 bushels comes up smiling in 1886, with 30,704,000 bushels being about twelve and one-half millions of bushels more than Pennsylvania produced in the latter year. This immense increase in the production of wheat is out of all proportion to the increase of population. It is rendered possible by the improvements in machinery as well as the increase in the area of the land under cultivation. Now with improved plows and harrows and drills and reapers and threshers and fanning mills one man will cultivate, harvest and thresh as much wheat as many were capable of doing before this improved machinery was invented. And it is to be remembered that almost all this improvement in machinery is the work of the nineteenth century. It is not very long since the iron mold board was invented, and almost all of us have seen plows with wooden mold boards.

Living men remember when the first grain cradles were introduced and before this the sickle then in universal use was almost the exact counterpart of the same implement figured upon the tombs of ancient Egypt. No improvement in cutting grain had been made in 2000 years and a sickle used by my grandfather in cutting his crops, and now one of the most valued of my possessions, has no merit that the same implement used in the days of the Pharaohs did not possess. Threshing was done by tramping with beasts, and in about the same manner as when the precept was given "thou shalt not muzzle the ox that treadeth out the corn." One of our most intelligent farmers told me the other day that he had threshed crops of grain when a boy by rolling a cylinder of wood over the grain in the straw as it lay upon the threshing floor. This cylinder or log of wood had projecting cogs upon its sides and was fastened at one end in the centre of the barn floor. a horse was hitched to the free end, furnishing the motive power and rolling it around the floor upon the grain to be threshed. Fanning mills are a recent invention and the old scripture method of winnowing by tossing the grain and chaff in the air on a windy day that the chaff might be blown away, was until comparatively recent years the method of cleaning wheat. And the result of this vast increase in the growth of wheat, is overproduction and the consequence of overproduction is low prices. In order to obtain the views of men who have given this subject special attention I addressed the commissioner of agriculture upon this subject, and I received the following reply from Mr. J. R. Dodge, the statistician of the department. "The causes of low prices are two at least, first a general tendency, the world over, in that direction; second a tendency here to overproduction of the products of agriculture. In the case of wheat, this country seeds at least 12,000,000 acres more than the home consumption requires; and as India, Russia, Romania, Chili and the Argentine Republic all have a surplus of wheat, of late years somewhat above the current requirements, the price is necessarily low. The increase of breadth in wheat is not extensive, but the demand has been less since 1880, than for a similar period prior to that date, because crops of Western Europe, have been larger, owing to a better yield rather than larger acreage. The price will be still lower if the world's supply is further increased beyond the consumptive demand." I do not like the word overproduction. It is often used to indicate under consumption. I know that at this very moment warehouses in London are groaning with the weight of woolen and cotton goods which are seeking a market, while thousands of unemployed workingmen pass by, insufficiently clad because no employment is given them and they are unable to buy the clothing they need. But in the case of wheat there is every reason to believe that there is an actual production in excess of all possible demand. It is said that the average consumption of wheat is five and one-half bushels for each individual; it is not easy to see how the consuming capacity of wheat using people can be increased beyond this and if the supply of wheat exceeds this proportion overproduction must ensue. The effect of overproduction on prices is in some respects remarkable. It has been calculated that if there be a deficit of one-sixth in a harvest prices would rise 100 per cent. and the following proportions are given by authority :

For a deficit equal to $\frac{1}{10}$ there will be a rise in price of . . . . $\frac{3}{10}$
" " $\frac{2}{10}$ " " " . . . . $\frac{8}{10}$
" " $\frac{8}{10}$ " " " . . . . $\frac{16}{10}$
" " $\frac{4}{10}$ " " " . . . . $\frac{28}{10}$
" " $\frac{5}{10}$ " " " . . . . $\frac{45}{10}$

And the converse of this is equally true. If there is an excess of production over consumption of one-tenth the decline in price may be three tenths or more, just as one vacant store room in a block will reduce the rent on all the rest. The same thing is illustrated by the story of a Spaniard who had returned from foreign parts and asked a jeweler the value of a beautiful turquoise which he showed him. The jeweler named a high price, the Spaniard delighted, showed him a number of others of equal size and beauty, but the jeweler named a much lower price for each. The Spaniard took the jeweler to his hotel where he showed him a trunkful of these stones. Upon seeing them, the jeweler said, "they are not worth anything." If diamonds were as common as charcoal they would have no value and the great increase in the production of diamonds following the discovery of the mines in Africa, has permanently reduced the commercial value of all precious stones of this class. And all these facts are in accord with and demonstrate the existence of a law more immutable than any other in economic science, namely, "that when production increases in excess of current market demand, even to the extent of an inconsiderable fraction, or is cheapened through any agency, prices will decline, and that when production is checked or arrested by natural events or artificial interference, prices will advance. We have now examples of decline in the price of almost everything, many commodities falling lower than at any time in a quarter of a century." The report of the Cincinnati Chamber of Commerce for 1887 shows that since 1881, the depreciation in mess pork has been 48.5 per cent.; in lard, 46 per cent.; hams, 24.4; shelled corn, 43; oats, 39.4; rye, 32.6; bran, 33.8; flour, 34.3; linseed oil, 30; salt, 13.6; cattle, 13.3; rice, 28.9; barley, 18.6; and wool 15 per cent. But the decline in the price of our own agricultural productions has been more than equaled by a similar decline in the products of other zones and in none has it been more extraordinary than in sugar. In 1880 the price of fair refining sugar in New York, was 5.08 cents per pound, 1884, .31 cents per pound, 1887 2.37 cents per pound. The use of some articles has been partly superseded by other newly created substitutes, the great increase in the production of cotton seed oil. made from what was formerly a waste product, and now used for cooking, manufacturing and other mechanical purposes, taking the place of 70,000.000 pounds of lard previously used annually for the same purpose. This has contributed not only to reduce the price and place of that important hog product in the world's markets, but it also diminished the production and decreases the price of almost all other vegetable oils, the product of the industries of other countries. Preceding this great decline in prices we find a marvelous reduction in freight charges. In 1860 twelve cents a bushel was about the lowest rate charged for the transportation of bulk grain from New York to Liverpool, and previous to that time the rate ran as high as twenty-seven cents per bushel But for the year 1886 the average rate for the same service was five cents per bushel and fresh meats were shipped from New York to Liverpool for one cent a pound and with commission, insurance and all other charges never exceeded two cents a pound. Great, however, as has been the revolution in respect to economy and efficiency in the carrying trade upon the ocean, the revolution in the carrying trade upon the land has been even greater and more remarkable. Upon the American railroads the average charge for moving one ton of freight per mile has been reduced from about 25 cents in 1869 to 1.05 in 1885; or taking one of our greatest railroads from 1.95 in 1869 to 0.69 in 1885. In the case of India wheat transported to England via. the Suez canal the decline in freights was from 71*s*. 3*d*. per ton in October, 1887, to 27*s*. in October, 1885, or more than sixty-three per cent. Between 1873 and 1885 the tolls and pilotage on the Suez canal were reduced thirty-three per cent. In the presence of this great decline in freights and in the value of farm products, a reduction in the price of farm lands is a necessary consequent, and with this decline in land values comes the failure of farmers who were financially embarrassed. The proportion between the assets and the liabilities of our farmers has been constantly changing to their disadvantage, financially, creditors become alarmed, judgments are hastily entered, midnight executions are issued, and other insolvents are added to the rapidly increasing list. It is true that crop failures in Juniata have contributed, as well as depression in prices, to bring financial embarrassment upon our farmers and to make farming unprofitable. In former times when a crop was short, prices advanced, and the deficiency in quantity was often more than counter-balanced by the increase in value. But low freights and facilities for distribution have made one price for everything in regions mutually accessible by railroads and steamships, and a deficiency in product at one point is generally equalized by an excess elsewhere, so that prices are seldom raised by local crop failures. Insolvency among farmers is not confined to our own land. Nearly all British writers dwell upon the immense losses to British farming capital, the result of crop failures, and the decline in the value of land in the United Kingdom and the like decline in the price of agricultural produce, due to foreign supplies competing with the domestic in their home markets.

The Bessemer rail, the modern steamship and the Suez canal, have brought the wheat fields of Dakota and of India to the very door of the British farmer and he must accept their prices and not those to which he has been accustomed. In view of this great depression in prices we naturally inquire what of the future? It seems less discouraging, than at first sight might appear. The increase in population in the north-west will break up the vast wheat-producing tracts and bonanza farms into smaller holdings, there will be a greater home consumption of their products and diversified crops will materially diminish the amount of the excess now sent abroad. The encouragement of our manufacturing interests so that our home market may be increased and our surplus disposed of at home is another agency to be invoked. Towns like Denver and Cheyenne will spring up and become centers for the consumption of agricultural products, and in extension of the population into the non-agricultural region will take much of the surplus. With better government in India and an increase in manufacturing industries affording other employment to the people, and the means of purchasing better food, more of their wheat will be consumed at home and less will be shipped abroad. An improved system of revenue by means of which taxes will be reduced upon the land and charged upon other property yielding larger returns, or in proportion to its value, a more economical administration of local affairs and greater caution in the purchase of high-priced farm machinery, also, will give relief. It may seem presumption in me to offer other suggestions, especially since the same subject has been under discussion in this institute, but I cannot refrain from saying that I believe some new methods of cultivation and new crops might be introduced with advantage. I have never seen an acre of land irrigated in Juniata, have any of you beheld such a thing? But in a dry season an acre of potatoes properly watered will be increased in yield fourfold, and very many of our farmers could, at small expense, irrigate portions of their land. I am not a farmer, but I am something of an agriculturist. The difference between the two, I believe, has been said to be, that a farmer is a man who makes his living by farming, while an agriculturist is a man who spends on a farm what he makes at some other occupation. I have a friend who is an agriculturist also; some time since he began filling up a pond with a view to reclaiming and cultivating it. He first threw stones into it until they came out of the water and then hauled earth upon them. A rough estimate placed the cost of this made ground at about five dollars per acre. This summer he planted potatoes upon a part of it, and had an extraordinary crop, bushels of fine tubers off a very few rows. A remarkable feature of this crop was that the potatoes were found very deep in the ground, they had gone down in search of the moisture that was near the old surface of the pond. Irrigation would have produced an equally fine crop.

Fruit growing merits attention and we are led to expect much from it after witnessing the success some of our citizens have had with their peach orchards. We are not a demonstrative people and are surely not given to ostentatious display, but I believe that we should erect a monument to the man who proved, by practical tests, that peaches can be successfully and profitably raised in Juniata. He gave new value to our sterile hills and if it be true that he who makes two blades of grass grow where one grew before, is a public benefactor, how much more are we indebted to him who establishes a new industry and shows that it can be profitably pursued. One of the hopeful signs of new prosperity to spring from this source, was seen only a few days ago, when 24,000 peach trees came to our county in a single day and were distributed amongst our farmers. But I shall not elaborate these thoughts. I know that with your intelligence and knowledge of your business your conclusions will be more accurate than my own. My task is now ended As you all know, our county is almost wholly agricultural, having no other industries except only a very limited amount of iron ore mining, and the welfare of all of us depends upon the financial prosperity of our farmers. With abundant crops and good prices the wheels of business will revolve steadily and without friction and all will thrive together, while with a reduction of crops and prices we shall have business stagnation and financial distress. We all place our dependence upon you; all hope that your labors may meet with abundant reward and that auspicious seasons and good prices may again crown your efforts with success. Ladies and gentlemen, farmers and farmers' wives and sisters and daughters, I salute you.

REPRODUCTION IN THE HONEY-BEE.

By Prof. GEO. G. GROFF, M. D., *Lewisburg, Pa., Apiarist of the Board.*

To the naturalist the means by which living beings reproduce their kind is always a subject of interest. Indeed, of all the functions of life, that of reproduction is the most interesting, the most wonderful, and to each species, the most important. Some forms of insects seem to exist in the mature state only that they may perpetuate their kind, and this being accomplished, they perish; the males in the act of fertilizing the females, the female, at once, when the eggs are safely deposited, neither parent ever seeing their offspring. In all the higher animals reproduction is accomplished through the intervention of the two sexes, the male and the female, but among many of the lower forms of life both male and female are frequently dispensed with. In some cases the offspring pass through so many and so great transformations that it has been exceedingly difficult to trace the whole life history of these strange beings. In some cases the germs of life are so small that their origin cannot easily be discovered, except with the most patient research. This is true of the honey-bee.

A knowledge of the modes of reproduction and of the laws governing the same is always of value to the agriculturist and to the naturalist, because in the case of the higher forms he may readily improve his cattle, grains, tubers and fruits by a careful study of and conformity to these laws, as is so well illustrated in the great number of valuable varieties introduced in late years. And also in the case of the lower forms of life, pests and all kinds of animals and vegetable parasites, if their habits, times and modes of reproduction be understood, we may often, with great ease, cut short the career of forms which, undisturbed, would have caused great losses. The different modes of reproduction in the organic world may be outlined as follows, viz:

Modes of Reproduction.

- Asexual:
  - Division,
    - Continuous.
    - Discontinuous.
  - Budding,
    - Continuous.
    - Discontinuous.
- Hermaphrodite:
  - Close-fertilization.
  - Cross-fertilization.
- True sexual:
  - Oviparous,
  - Ovaviviparous,
  - Viviparous.
    - Aplacental.
    - Placental.

The minute animals called animalcules which live in stagnant waters, in damp places, and in the sea, in many cases reproduce their kind in some asexual way, *i. e.*, without the intervention of the sexes. Of these asexual methods there are two principal ones. In the first, the body of the parent splits into two or more pieces, which, by absorption of nutrition, rapidly grow into perfect animals. Sometimes the young remain attached to the parent germ, and then we have "continuous" division, and the resultant is a "colony" as is true of sponges, sea-mats and numerous other marine forms. In other cases the young are all set free from the parent organisms. Budding differs from division in that the young appear on the sides of the body of the parents as small buds or enlargements. They remain attached, growing larger and larger, until they become perfect animals in all their parts. When development is completed they either remain attached to the parent or else are set free to live independent lives, in the first case forming "colonies" as in continuous division. Coral colonies are formed in this way. In some of these lowly asexual forms the young are entirely unlike their parents, and at no period of their lives resemble them. These beings of the second generation bring forth young, which return to the original type, that is, resemble the grandparents. This is called "alternation of generation." Jelly fish are such intermediate forms. Nearly all the lowest plants, as moulds, mildews, blights, etc., are asexual.

The next mode of reproduction is the hermaphrodite. In this the sexes both exist in the same individual. This is the common mode in the higher plants, the male and the female elements being in the same flower. The common earth-worm is a true hermaphrodite, as is the tape worm. In the earth-worm we have *cross-fertilization*, that is, two individuals reciprocally fertilize each other, while in the tape worm, which fertilizes its own ova, it is called close. Nature generally abhors close fertilization, or, at least, usually contrives that it shall not continue the permanent order of things with any group of beings. Thus, in plants, the fertilizing pollen is carried to distant plants of the same species by the winds, or by honey-seeking insects.

The highest mode is the true sexual in which the sexes exist perfect in distinct individuals. To this group belong fish, reptiles, birds, mammals and many insects. The lowest class here is the oviparous, in which eggs are laid by the female and then hatched by heat applied externally, as in insects, fish, reptiles and birds. Ovaviviparous animals produce eggs, but these are retained within the body of the female until hatched. This is true of some reptiles. In the viviparous mode the eggs exist, but are very minute, and development proceeds within the body of the female. The aplacental animals, opossums and kangaroos, bring forth their young in a very imperfectly developed state, while in the placental animals the young are much farther developed at the time of birth, as is true of all the domestic animals. *Bees are oviparous insects*, in which an egg is laid, which in time hatches into a worm (grub, larva or caterpillar). This, after a time, spins a cocoon and becomes the quiescent pupa, and after a variable

Worker. Queen. Drone.

ITALIAN BEES.

time the pupa changes into the image or perfect insect. The honey-bee has always passed through all the stages of the egg, the worm, the pupa and the perfect insect.

In a perfect colony of honey-bees in the summer time we find one queen, a few hundred drones, and several thousand workers, of the last from 10,000 to 40,000. Now, that eggs and worms and young bees are found in bee hives was long known, but by what means the eggs were laid for a long time baffled the most careful observers. The queen bee was generally considered the ruler of the colony, and a *male*, hence, in Shakespeare, we read:

> "They have a king and officers of state."

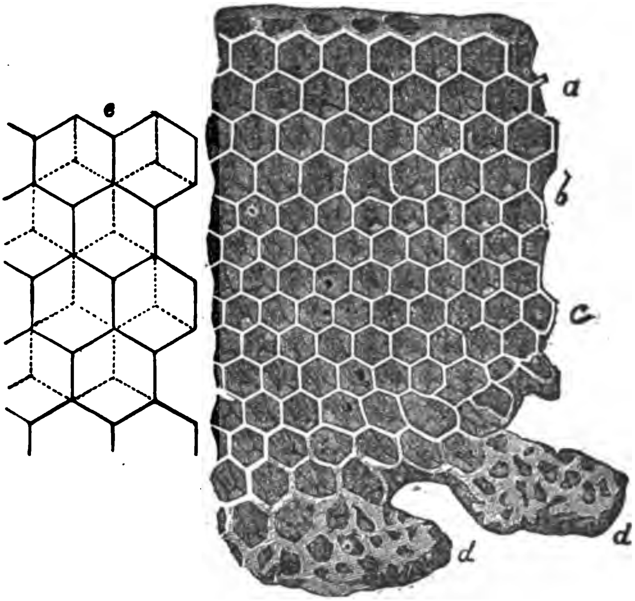
And in Virgil, the Latin poet,

> "First of the throng and foremost of the whole
> One stands confest, the sovereign and the soul."

The naturalist Aristle has left a remark showing that some observers of his time, or possibly earlier, had a clue as to the origin of bees, for he says, "Some say that the rulers produce the young of the bees." About the time of Christ, Virgil, the poet already quoted, gave the following method for replenishing depleted bee-hives. A young bullock is to be killed by being suffocated. His body is covered with flowers and allowed to lie in a secluded place until it decomposes. Worms will appear in the putrid mass, which, in time, will hatch into bees, and then if the empty hives are near the new bees will enter the same. Virgil states, however, that this is the method *said to be practiced* in Egypt, but some early English writers gravely recommended the plan as the correct thing to do.

The earliest mention I find of any modern person knowing the true method of bee-reproduction is that of Joseph Warden, physician of Corydon, England, who, in 1617, published a curious and interesting little book, entitled "The Feminine Kingdom; or, the True Amazons." In this book he tells us that the queen is the one female in the colony, and that she is at once the ruler and mother of all within the hive. Butler, an English bee-keeper of an earlier date, seems also to have had a correct view of the same matter. Recent students have cleared the matter all up, and we are now able to understand quite fully what so long puzzled our predecessors. We will consider first the origin of the queen, then of the workers, and last of all, of the drones. The queen is produced by two methods, which may be termed the *ordinary* and the *extraordinary* methods. As to the ordinary way: In a strong colony of bees, in the months of May and June, and sometimes later (this is for the latitude of Pennsylvania), there will often be found large cells, which on the exterior much resemble ground or peanuts. These cells are generally at the sides of the combs, though they are sometimes found on the face of a comb. They have thick walls and an internal cavity much greater than that found in either worker or drone cells.

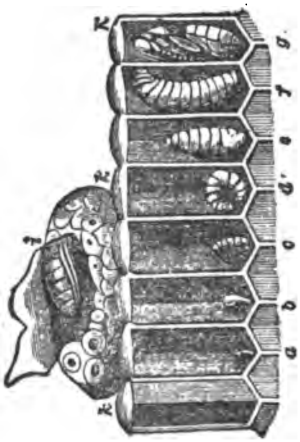
A peculiarity of the queen-cells, for so these are called, is that *the mouth opens downward*, while all other cells in the hive are horizontal. This arrangement is doubtless made that more room may be secured for the cell, for naturally the combs are placed too close together to build the queen-cells in the ordinary horizontal position. At any rate, queens will hatch from cells placed horizontally. In these cells eggs are placed, by what member of the colony, is not certainly known. A single egg is placed in each cell, some say by the queen, others think by the workers. A number of careful observers have declared that they have seen the queen in the very act of depositing eggs in these cells. No one doubts that the queen lays these eggs.



Honey-Comb.

a—Drone-cells. *b*—Deformed cells. *c*—Worker-cells. *d d*—Queen-cells.

In time, they hatch into young queens, if the colony is strong, and the weather is favorable, the young queens will be ready to emerge in sixteen days from the time the egg becomes a worm. However, if the workers are not ready for the new queen, they will confine her in her cell, feeding and caring for her there. Under favorable conditions, about eight days before any young queen will hatch out, the old queen leads off a portion of the bees to form a new colony, leaving the old home for the new queen, who will, in a short time, fully replenish it with bees. So soon as a young queen emerges from her cell, she makes a tour of the hive, and finding any queen cells, unless prevented by the workers, proceeds to tear them open and destroy the immature queens. In case the workers prevent this destruction, a second swarm is given off, led by the new hatched queen. It is a curious fact, that the queen-bee does not spin a complete cocoon, but leaves one end open, which makes her destruction very easy to any rival. About the only use the queen makes of her sting is to destroy her rivals with it. If the weather becomes bad, and the honey flow ceases, the workers frequently destroy all the queen-cells, thus preventing all swarming for



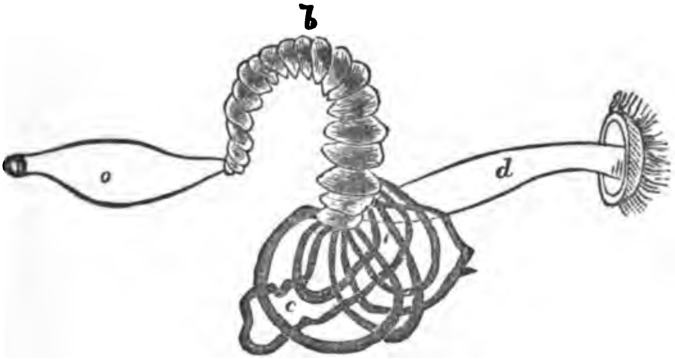
Egg and Brood.

b and *c*—Eggs. *d*, *c*, *f* and *g*—Various sizes of larvæ. *h*—Pupa. *i*—Pupa of queen, in queen cell. *k*, *k*—Caps.

the season. On this plan, modern beekeepers prevent second swarms, by opening the hives and cutting out all queen-cells.

What we have called the extraordinary method follows. Should the queen of a healthy colony be lost through any accident, there being in the colony *worker larvæ* not over three days old, the workers will select some of these worms, destined in the ordinary course of things to become worker-bees, and by enlarging their cells, by assiduous attention, feeding them almost constantly upon a peculiar substance called "Royal Jelly," will produce, in due time, a number of healthy young queens, one of which, the first to hatch, becomes the leader of the colony. This important discovery, that the queen proceeds from a worker-egg was first announced by Schirarch, a Saxon clergyman, in 1771. (It is an interesting fact that nearly all of the great discoveries in bee production have been made by clergymen.)

On this discovery depends the modern methods of commercial queen-rearing, by which queens are now produced, in every modernized apiary the world over, many beekeepers making queen-rearing an exclusive business. Though the queen hatches in *sixteen days*, the drone requires *nineteen* and the workers *twenty-one days*. The shorter period is probably due to the much more abundant and the richer food supplied to the queens, also because she has a more roomy cell in which to develop. This is an excellent illustration of how much environment will do for a developing animal. On these influences, the Rev. L. L. Langstroth has written in his classic work on the "Hive and Honey Bee." He says: "The peculiar mode in which the worm designed to be reared as a queen is treated, causes it (1) to arrive at maturity almost one-third earlier than if it had been bred a worker. And yet, as it has to be much more fully developed, according to ordinary analogy, it should have had a slower growth. (2). Its organs of reproduction are completely developed, so that it is capable of fulfiling the office of a mother. (3). Its size, shape and color are all greatly changed. Its lower jaws are shorter, its head rounder, its abdomen without a receptacle for secreting wax and its legs have neither brushes nor baskets, while its sting is more curved and one-third longer than that of the worker. (4). Its instincts are entirely changed. Reared as a worker, it would have been ready to thrust out its sting at the least provocation; whereas, now, it may be pulled limb from limb, without attempting to sting. As a worker,

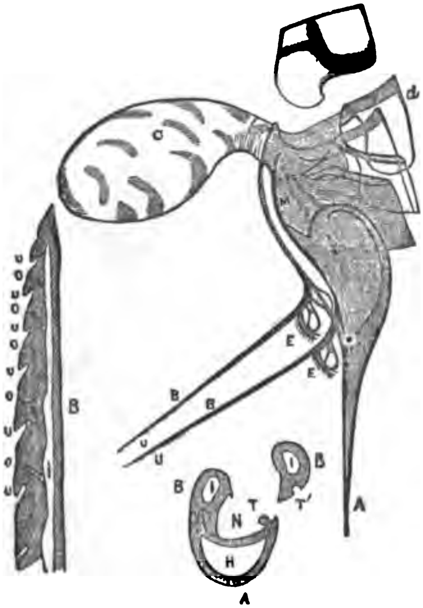


Alimentary Canal of Bee.

o—Honey stomach. b—True stomach. c—Urinary tubes. d—Intestine.

it would have treated a queen with the greatest consideration; whereas, now, if brought into contact with another queen, it rushes forthwith to mortal combat with its rival. As a worker, it would frequently have left the hive, either for labor or exercise; as a queen it never leaves the hive after impregnation, except to accompany a new swarm. (5). The term of its life is remarkably lengthened, as a worker, it would not have lived more than six or seven months; as a queen, it may live seven or eight times as long. All these wonders rest on the impregnable basis of complete demonstration, and instead of being witnessed only by a select few, may now be familiar sights to any beekeeper who prefers to acquaint himself with the facts, rather than to cavil and sneer at the labors of others."

Of the anxiety of bees over the loss of their queen and joy on finding her, the same writer says: "A large hive standing at a distance from any other, was removed in the morning of a pleasant day, to a new place and another hive, containing only comb, was placed in its stead. Thousands of workers, which were out in the fields, or which left the old hive after its removal, returned to the familiar spot. It was affecting to witness their grief and despair; they flew in restless circles about the place where once stood their happy home, entered and left the new hive, continually expressing in various ways their lamentations over so cruel a bereavement. Towards evening, they ceased to take wing and roamed in restless platoons in and out of the hive, and over its surface, acting all the time, as though in search of some lost treasure. I now gave them a small piece of brood comb, containing worker-eggs and worms. What followed the introduction of this brood comb took place much quicker than it can be described. The bees which first touched it raised a peculiar note, and in a moment the comb was covered with a dense mass; their restless motions and mournful noises ceased, and a cheerful buzz at once proclaimed their delight. Despair gave place to hope, as they recognized in this small piece of comb the means of their deliverance. Imagine a large building filled with thousands of persons, tearing their hair, beating their breasts and by piteous cries, as well as by frantic gestures, giving vent to their despair; if some one should enter this house of mourning and by a single word cause all these demonstrations of agony to give place to smiles and congratulations, the change would not be more instantaneous and wonderful than that produced when the bees received the brood comb."



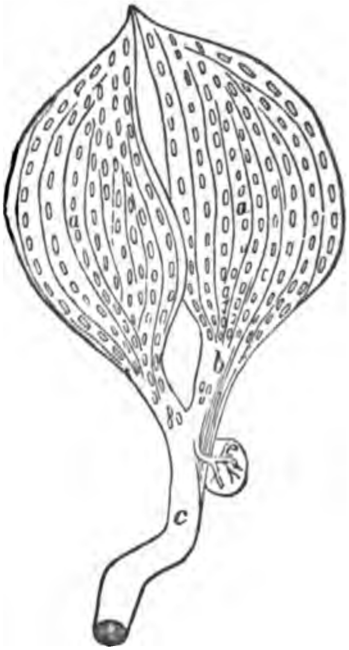
Worker's Sting, Magnified.

a—Tube. *b b*—Barbed spears drawn out of tube and turned back. *c*—Poison sack. *d*—Muscles.

If the weather is favorable, on the third day from the cell, the young queen goes forth on her "bridal tour," and in a few hours, if she is successful, she returns, bearing with her the organs of the male, who has perished in the act of impregnation. If the third day is cloudy, or wet, she goes forth on the first favorable day, and she continues to go forth day after day until she is successful. The queen is always (some object to this) fertilized in the open air, while on the wing, *and but once in her life.* This was first announced by the blind naturalist Huber, at the close of the last century. The fertilizing element received from the male is stored in a little receptacle (*e* in the figure) and a little of it ejected as the eggs pass down the oviduct (*c*), thus vitalizing them.

The queen in her prime may lay from 2,000 to 3,000 eggs in a single day. Her second year is generally thought to be the most prolific, and after that she gradually declines in value. The queen lays such large numbers of eggs however, only during the busy season of the year when honey is coming in rapidly. During the winter months, and during a sudden cessation of the honey flow, she ceases to lay almost entirely, though I think a few eggs and worms will be found at most times in vigorous colonies. This is a wise provision to protect the colony from destruction through loss of the queen.

When a queen has grown old and is no longer very prolific, the workers see that a new one is reared, and the old one is then "superseded," though occasionally the old and the young queens have been seen living in harmony in the same hive, and actually at the same time, on the same comb. Some bee men think that the workers will, unaided, attend to the destruction of feeble queens, but at present a large number of the more progressive apiarists prefer to do this themselves, thus insuring at all times to all their colonies, young and vigorous queens. This is one important particular in which modern bee-keeping differs from the old.

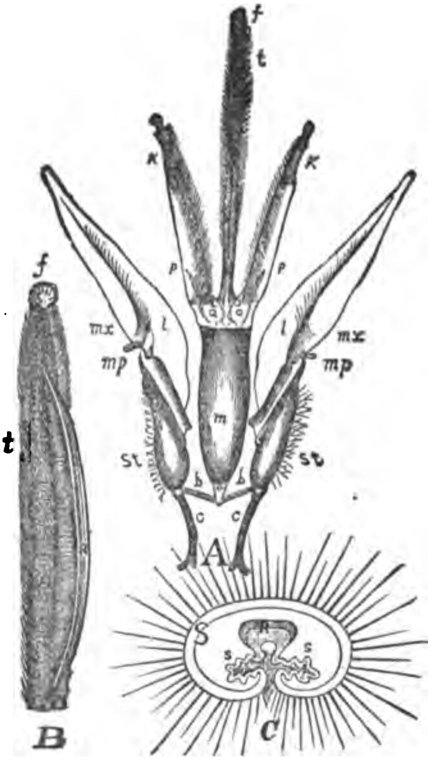


Queen Organs, greatly modified.

a, a-Ovaries.
b-Oviducts.
c-Oviduct.
d-Sting.
e-Spermatheca.

The eggs of the bee are hatched by the united heat of the colony. The interior of a hive is always warm, even in the dead of winter and hence, when the number of bees in a hive becomes small the colony the perishes, being unable to maintain the requisite degree of animal heat. Hence, also, the reason for increasing only by swarming.

If the queen-bee fails to become fertilized before she is twenty-one days old, she remains through her life sterile. This was first observed by Huber. In 1845 Dzierzon, a Catholic clergyman of Germany, observed that young queens not fertilized and old nearly exhausted queens, alike laid eggs, all of which hatched only drone bees. After repeated observation, Dzierzon announced the discoveries and a theory that of *parthogenesis*, which, in short is, that some animals have, under peculiar circumstances, the power of bringing forth young, without the intervention of the male. In the case of bees, these unfertilized eggs hatched only into drones. Mr. Langstroth, about 1851, sent an old drone-laying queen to Dr. Joseph Leidy, the renowned scientist, who found that the receptacle in which the male element is stored, was entirely empty. The same observation has been made by competent persons on young drone-laying queens. It seems then, that a queen can lay eggs which will produce queens, workers or drones. The queens come from ordinary worker eggs, laid in special cells, and attended with special care. The workers come from fertilized eggs, laid in ordinary cells, while the drones come from unfertilized eggs. It would seem that the queen can will whether she will have worker or drone progeny, she voluntarily discharging the male fluid upon the eggs as they pass down the oviduct, or withholding it. This point, is however, in dispute, some believing that the small worker cell compresses the body of the queen and that this pressure opens the mouth of the vessel containing the male fluid. Be that as it may, the queen can also lay drone eggs in worker cells, and worker eggs in cells which have only just been commenced, and where this pressure cannot possibly be exerted.



A—Tongue of broken and adjacent parts. *B*—The tongue greatly magnified. *C*—A transverse section of the tongue.

Drone Organs, greatly magnified.

The workers hatch in twenty-one days. A careful microscopic study of their sexual system (first made in the time of Huber, and for him), shows them to be partially developed females, the sexual organs being very rudimentary. Here rests the possibility of developing *any worker worm* into a queen if it is only taken early enough, and subjected to the proper conditions which have been already explained. And here is a most wonderful phenomenon, first observed by Reim in the last century. In colonies long queenless, it will sometimes happen that a worker will begin to lay eggs, *but these eggs always hatch into drones.* This is another form of parthenogenesis, an imperfect female bringing forth young without aid of the male. These fertile workers have often been studied in recent years, indeed, are at times a great annoyance in an apiary, so that of their existence and drone-producing power there is no doubt.

The drones hatch in nineteen days. They come from cells larger than those of the worker bee, and may be distinguished before hatching by the capping over the larva, which is in the case of drones always strongly convex, while it is flat for workers. Drones are only found in good colonies during the summer months, but should a colony be queenless, they may be found in the autumn or even in the winter, being preserved in such colonies to fertilize the hoped-for queen! A most wonderful illustration of instinct. Also, if the queen is supplied only with worker comb, she will insist in depositing some drone eggs, even though in the worker cells.

The object for which drones existed was long a mystery to bee-keepers and naturalists. By some they were supposed to be water-carriers; by others, the heat-producers of the colony. Some supposed that they brooded over the eggs laid by the queen; others, that they were without sexual organs, and yet impregnated the eggs of the queen by a vapour which proceeded from their bodies. It is now known that they are fully developed males, and their only use is to fertilize the queen. It may, at first sight, seem strange that there being but one queen in a colony, and she impregnated but once in her life, so many drones should be produced. This is doubtless a wise provision for the protection of the colony. The queen is the mother of all the colony. Her loss is a most severe one. Hence, it is desirable that she be exposed for as short a time as possible when on her bridal flight. The large number of drones in the air insures a speedy fertilization, and hence, less damage from birds and other enemies. Drones being produced from eggs unacted upon by the male elements, it follows that a queen being pure bred, she may still be the mother of hybrid queens and workers, while the drones will remain pure. This is an interesting fact.

The "massacre of the drones" has long been a matter of interest. Huber declared that in the autumn the workers made war upon the drones and stung and worried them to death. The truth is that whenever the honey flow ceases, or becomes scant, the drones are driven from the hives. They sometimes wander from hive to hive, until driven from all, they perish of cold and hunger. They are not stung to death, but rather are bitten and worried and refused food, which they cannot gather for themselves, and so they congregate on the bottom of the hive, or at the entrance, and miserably perish. A favorite point of attack on the drones is at the base of the wings, which are gnawed and rendered useless.

Drones being non-producers in colony, bee-keepers have contrived to limit their production by cutting out all drone cells, and by supplying foundation of worker cells only. In this latter case the workers will build drone cells in every remaining available place, and the queen will even deposit drone eggs in worker cells, which latter are lenghtened to meet the needs of the larger occupants. All this shows the wonderful instincts of this wonderful insect.

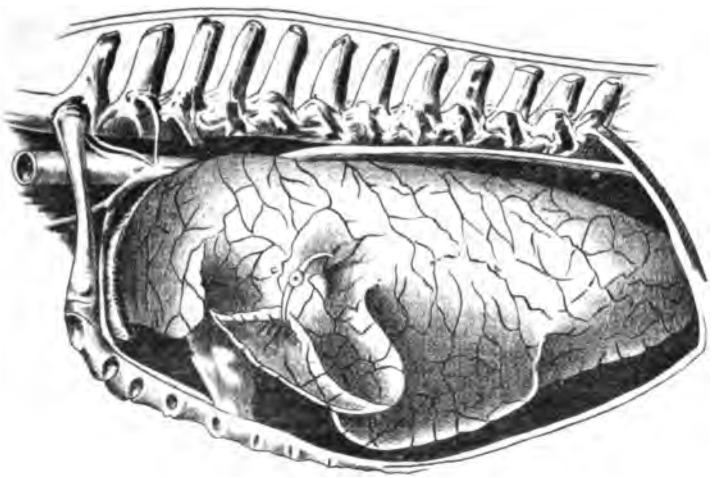
THE BOVINE LUNG AND ITS DISEASES.

By the SECRETARY.

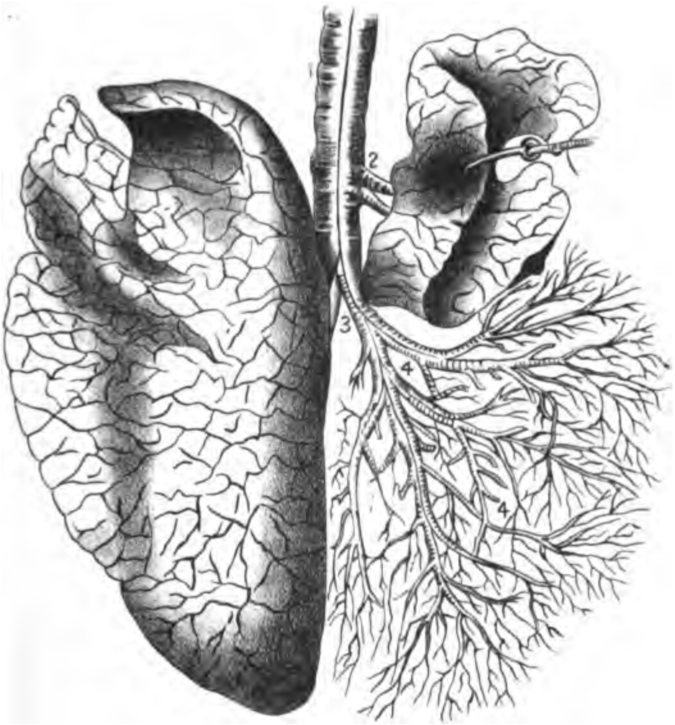
When we bear in mind the many and sudden variations of temperature to which the sensitive linings of the lungs are subjected, it is not at all strange that we find them subject to a great variety of sudden and violent diseases, nor is it surprising that all of these diseases are very difficult of treatment, for, of all of the organs of the body, the lungs (and heart) can have no rest during disease; their duties go on; the stomach, muscles and nervous system can be rested or relieved from labor, but the lungs and heart must keep up their work uninterruptedly, or death ensues. When, in addition to this, we remember that the inspired air comes in direct contact with from three hundred to five hundred (according to the size of the animal and volume of its lungs) square inches of surface, we cannot but be surprised that disease is not oftener indicated. Animals placed in an impure atmosphere or brought from a high temperature to a low one, with each inspiration bring volumes of cold or partially warmed air in contact with four hundred square inches of the delicate membrane which lines the bronchial tubes, and that inflammation is often thus caused is not at all wonderful.

Among the causes which are responsible for disease of the lungs of animals, Prof. Law gives the following:

1. The great extent of the respiratory surface of the lungs, two hundred to five hundred square inches. 2. The extreme tenuity and delicacy of the membrane covering this surface, protective cells (epithelium) being almost wanting in the air cells, contrary to what exists on every other mucous surface of the body. 3. The extraordinary work to which the lungs are subjected in the rapid paces and severe efforts made by the horse. 4. The close, impure air of the stable in contrast with the clear, bracing air of the field to which the colt has been accustomed. 5. The effect of the hot, relaxing air of the stable is not only on the lungs directly but on the skin, with which the lungs and all internal organs so closely sympathise. 6. The heats and chills and violent nervous excitement to which young horses are subjected in passing into training and work. 7. The changes of locality, feeding and managements to which young horses are subjected on leaving the breeder. 8. The variable weather and sudden and extreme changes of spring and autumn. 9. The susceptibility which results from the want of habitude of bearing extreme heat and cold, and which tells especially at the above seasons. 10. The draughts of cold air to which animals are often subjected and particularly when warm and perspiring. 11. The frequent exposure to cold, drenching rains, night dews and the like, after the excitement and relaxation consequent on a hard day's work. 12. The arrest of circulation through the lungs, owing to imperfect aeration of the blood when an animal is out of condition or is driven at a pace beyond his power of endurance.



The left lung *in situ*, the side of the chest being cut away.—*Simonds*.



1, the windpipe; 2, the third bronchus; 3, the two principal bronchi; 4, the ramification of the bronchial tubes.—*Simonds*.

Although the above by Dr. Law was written more with special reference to horses, yet most of the points have an almost equal application to cattle. Any cause which overheats the animal will take the place of speed in the horse; anything which causes sudden changes of temperature will take the place of exposure to cold air when overheated by travel, and in nearly every case, the exciting cause, as applicable to horses, may be duplicated in lung disease of the bovine tribe.

Of all the causes of lung disease among cattle, the most prevalent is undoubtedly that of sudden changes of temperature, and it is a common belief among farmers that inflammation of the lungs can only be caused by a sudden change from a high to a low or lower temperature, and they entirely overlook the fact that probably a majority of cases of lung troubles among cattle are due to confinement in a hot and impure atmosphere, and often without the accompaniment of sudden changes; constant breathing of vitiated and impure air will produce an effect quite as serious as sudden changes from a warm stable to the open air. Of the large number of extensive outbreaks of lung disease which have been brought to our notice in our search for contagious pleuro-pneumonia, the most striking was that of twenty-six cattle usually kept in a close and warm stable and supplied with water in their troughs; they were not allowed to go out of the stable day or night; during a very cold night the water pipes froze up solid, and the next morning, in the face of a cold rain, the animals were turned out to get water at a spring more than half a mile from the stable. The next morning twenty-four of the animals were suffering from bronchitis, inflammation of the lungs and believing the disease to be contagious, the State Veterinary Surgeon was at once sent for, and correctly arriving at its nature from a history of the case as well as from a critical examination, was able to save all but two. Similar cases of imprudent treatment might be given, and others will no doubt occur to every reader of this article who has had the care of cattle.

One of the forms of lung disease which is oftenest met with in veterinary practice, and which is often confounded with ordinary inflammation is

Bronchitis.

The lungs throughout their whole substance are permeated by tubes varying in diameter with their location, being large near the windpipe and decreasing in size as they increase in number and ramify throughout the body of the lungs. When by any cause an inflammation of the mucus lining of these tubes exist, we have a case of bronchitis. In many cases bronchitis may be said to be a sympathetic disease as it originates from other and adjacent inflammations, without the mucous membrane having been subjected to any cause through the medium of the windpipe. The true art of the veterinarian is brought into play in determining whether the disease as he finds it is due to a direct cause or whether it is due to local inflammation and secondary causes; the distinction between the two is all the more important because a different line of treatment is indicated for each. If the cause is secondary the first step is to remove that cause. If it be direct the first attempt will be directed to decreasing the inflammation. Bronchitis (direct) is usually due to sudden changes of temperature, but it may come from damp, foul or vitiated air· it may be due to the inhalation of unusual or, irritating vapors; or as before stated, it may be due to sympathy with some adjacent diseased organ in an inflamed condition.

J. Woodruffe Hill, thus gives the symptoms of this disease:

"Bronchitis is usually preceded by a short tight cough, accompanied by increased respiration, with more or less febrile disturbance. As the disease progresses the feverish symptoms increase, the nose is dry, the heat of the skin increases, the breathing wheezing, more difficult, and accompanied by a mucous ralé. The cough is frequent and painful, and is suppressed by the sufferer as much as possible; movement aggravates it and causes distress. At first a limpid discharge issues from the nostrils and this subsequently becomes thick and more copious, and ultimately *muco-purulent.* The eyes are inflamed, the pulse accelerated, and unless speedily relieved suffocation terminates the case. The animal loses all appetite and the emaciation is rapid during the progress of the disease. The skin is hide-bound, the coat harsh and staring and the body drawn up."

The above extract from Dr. Hill clearly indicates that any treatment in cases of bronchitis, to be effective, must be quickly applied and that all delays are dangerous and increase the danger of ultimate death; mustard plasters to the throat and trachea; breathing warm vapor or steam; warm mucilaginous drinks; gruel; linseed tea should be given; if at all costive small doses of linseed oil should be given, but upon no account should strong and active purgatives be given. With this and similar disease, more animals are killed by the use of the powerful purgatives than properly succumb to the actual disease. The writer has seen cases where numbers of animals have been killed by the ill advised use of purgatives in connection with lung diseases, which, under fair and proper treatment, should have fully recovered.

Dr. Hill prescribes the following to be given in thin gruel twice or three times each day to a full-grown animal:

Spirits ether (nit.) and spirits aromatic ammonia each one ounce, linseed oil, six ounces; for calves one to three months old one-third this amount, and to others in proportion.

In addition to this, Dr. Bridge recommends from one to six ounces of brandy or whisky in water every three hours. In this, as in all diseases of the lungs, warm covering and an abundant supply of pure and warm air are essential to recovery.

Inflammation of the Lungs—Pneumonia.

Inflammation of the lungs may be due to any of the exciting causes which we have assigned to bronchitis. It is distinct in its nature from bronchitis from the fact that while the latter is an inflammation of the mucous lining of the air-passages of the lungs, pneumonia is an inflammation of the substance of the lung itself. The early stages of this disease are usually characterized by chills, which, while they often escape the attention of the owner, are soon followed by fever; the pulse is greatly increased and the temperature increased sometimes to one hundred and seven degrees; the nose is dry and hot; eyes bloodshot; head extended, and everything indicates the difficulty and pain which attends breathing. The early stage of the disease is essentially one of congestion, and percussion gives a flat and dead sound, showing engorgement and congestion. Unless checked here, the disease soon passes into the hepatization stage and cure becomes much more difficult. In this stage of the trouble the cough is very painful, and the eyes are sunken and the fore-legs are thrown wide apart, so as to give more room for the lungs, which are now very much increased in bulk and which are unable to perform their functions because they have not room for proper expansion.

In treatment for pneumonia the main items to be depended upon are stimulants and counter-irritation; any species of stimulating drinks may be given, and the most convenient and most readily accessible counter-irritants should at once be applied. An hour or two lost while waiting for the veterinarian may prove fatal; strong mustard should be applied to the exterior; as in bronchitis, spirits of ether (nit.) and of ammonia may be given in gruel or warm water—one ounce of each every four hours will be safe. If mustard is mixed with turpentine its action will be quickened, and if the hair is removed by a razor or scissors it is all the better. The quick action of the counter-irritants is all important, and may do more in a half hour to save the animal—in the early stage of the disease—than three hours of the presence of the veterinarian six to ten hours later.

Pleurisy.

Pleurisy differs from the two diseases which we have already named in being an inflammation of the pleuro or membrane which surrounds the lungs and which lines the chest. It usually commences with severe fits of shivering, which, as early as the days of Youatt, was considered "a very peculiar symptom which should be carefully studied. Even when the animal is otherwise quiet, the shoulders and upper part of the chest are trembling violently."

The causes of and treatment for this disease are essentially the same as those already given for bronchitis and pneumonia.

In all treatment for diseases of the lungs, the two needed elements are promptness and rapid action of counter-irritants; in many cases, before the disease has been detected by the somewhat careless owner, it has progressed unchecked to a point beyond the control of even the best practitioner. When such cases are found, the first thing to be done is to apply counter-irritants. To do this effectually the hair may be cut or shaved off, and strong mustard and turpentine applied to the skin. The skin, muscle and matter intervening between the counter-irritant and the lungs is thick and difficult to penetrate even with vigorous applications, and much less care is needed than with the human patient, in whom the retarding causes are much less formidable. Anything which will keep up and maintain the normal strength of the animal may be given: warm gruels, whisky and water, eggs broken into warm milk, bran or oat-meal in warm water, spirits of aromatic ammonia in half-ounce doses, spirits of ether (nit.) in similar doses, either repeated every four to six hours, will all tend to keep the system up in strength, and the counter-irritants will accomplish their work better than in a weakened and reduced animal. At once remove the animal to a clean, dry and well ventilated stable, with air, which should in no case be cold; cover up with warm cloths; if possible, give a steam bath, but guard against a chill when it is removed; if costive, give small doses of linseed oil until action of the bowels is produced, but avoid any severe action which will tend to reduce the strength of the animal just at a time when all available nerve force is essential to recovery. Prevent all motion as much as possible, and so important is this that if the animal is first found in the field where the temperature is not too low and there is no danger of rain, it is often best to leave it there for treatment, the danger being that anything gained by stable treatment will be lost by injury caused by motion.

ON THE LIMITATIONS OF AGRICULTURAL EXPERIMENTS.

By Prof. GEO. H. COOK, *Director New Jersey Experiment Station.*

[An address at the Bellefonte meeting.]

In comparing notes upon the large amount of work experiment stations were called upon to do, when there were but few of them, one could not but feel that there must be some limit set to it. The subjects demanding investigation were more than could be met by those engaged in such work. Hence the title which my friend has given to this paper. Since there is now a prospect of having a greatly increased number of workers in this field, it would be well to change the title, and make it the limitations of agricultural experiments and the means of extending them.

Agricultural experiment tations were established to meet the wants of intelligent working farmers. Many of them in the same community were feeling like wants and it was a wise economy to have one establishment which could answer the questions and do the work required for all. If the farmers interested could come together and agree upon the questions which it would be most important to have first answered, the course of the experiment stations would be comparatively plain. But there is no such agreement among those who seek the aid of the stations. Hence the managers of such stations are left to determine the subjects they will investigate, and the work they will do—and they must decide which of the questions presented it is most important to answer first, which the station is best prepared to answer, or which will be most useful. The questions coming to any single station are very numerous, far beyond its capacity to answer, hence the need of defining and limiting the work to be undertaken.

Examples of the questions asked can be found in every station, but I shall perhaps best succeed in illustrating the subject by naming some which have come to the station with which I am connected.

"Is the commercial fertilizer bought worth the money it costs?" is the question most frequently asked of our station. A chemist can tell whether its constituents can be bought in market for the prices asked, but it still requires a careful farmer to determine whether the increased crops produced by it will pay its cost. In other words the commercial value and the agricultural value are not necessarily alike, and it requires the skilled farmer as well as the chemist to tell whether the fertilizer can be profitably used. The farmer would seem to be the only one needed to settle the question asked, and if all dealers in such articles were honest and intelligent, there would be no need for the chemical examination. But the weakness of human nature is such that nothing but the chemist's tests and publication are sufficient to hold the dealers to the furnishing of goods of standard purity. More than 40,000 tons of such fertilizers were used in our State last year, which were sold for considerably more than a million dollars, and the amount sold in the whole United States is more than a million tons annually. Of the quality of these the farmer can form no judgment from their color, smell or taste, or their general appearance. The analysis and publication of the composition of these fertilizers has a most salutary effect. Honest manufacturers are protected, and careless ones are held to their guarantees. Occasionally a brand of fertilizer of worthless character is put upon the market. We lately had one which was sold for $45 a ton which could have been made for $3. This was an extreme and unusual case, but it suffices to show the importance of a careful control of the trade in such articles by an experiment station. And the demand for such control is sufficient to occupy the full force of a station of the size contemplated by the experiment station law.

"What is the cheapest and most profitable food for milch cow?" is a question which interests a large proportion of our farmers. The nearness to the great markets of the country, causes any good quality of hay to bring so high a price that it is more profitable to sell it than to undertake to feed it to common stock. But there is a constant and increasing demand for milk in towns and cities, and there are by-products of manufacture to be had at low prices which, when properly mixed with the coarser products of the farm, make a cheap, nutritious and palatable food for cattle, sheep and swine. In this way the spent grains of the breweries, the residue from the glucose factories, the oil meal, the cotton seed meal, the bran, and the hominy waste, can by the chemist be proved to furnish the food constituents which, joined to those of the straw, chaffed corn-stalks, and the coarse hay of the farm, make a cheap and good ration for cattle. In this way our station in one case prepared a day's ration for a cow at a cost of nineteen cents, when the daily ration of clover hay for the same animal was worth from 25 to 30 cents., and careful weighing of cows fed upon the two rations and measurement of their milk proved the chemist's ration to be as good in every way as the other. Savings like this are sufficient to make a losing business into one of profit.

Another question frequently asked is, "What is the best kind of wheat to sow for profit?" There is almost as much difference in the yield of different varieties of wheat as there is in that of apples, though the size of the straw and the chaff of the heads entirely hide the appearance of the grain until it is threshed, and then the difference is laid to the soil or the weather, and not to the variety of wheat grown. We have some varieties which will yield 5, 10 and even 20 bushels per acre more than others, and yet this is not fairly recognized by farmers. The growth of these side by side under the same circumstances, under the direction of the experiment station with the careful use of weights and measures will reveal remarkable differences in this most important article of human food. The wheat crop of the United States is from 400,000,000 to 500,000,000 bushels a year. When the question proposed is properly answered, it will return to the country more than all the experiment stations have cost. The varieties most commonly grown now are more productive than those formerly in favor, but there is still room for a great increase. A case came under my observation last year which may illustrate and enforce the statement just made. A farmer with whom I am well acquainted, had a good variety of wheat, but seeing some of larger and plumper grain, and it being reported to be a productive variety, he bought enough to sow an acre. The rest of his field he sowed from his own grain. The soil, tillage and fertilization was the same throughout. The new kind grew as well as the old, in fact it looked better through all the time of its growth; the straw was taller and heavier, and the heads larger—and the farmer harvested it with the intention of having that for his seed the next year. When he threshed the crop the new kind yielded 22 bushels per acre, and the old kind 44¾ bushels per acre. It is needless to say that the new variety was given up. In the uncertainty of seasons and soils nothing but the methods of the experiment stations will settle such questions as this, in a reasonable time.

"What can be done to secure a good and profitable crop of potatoes?" is a question most frequently and most earnestly asked for the last forty years or more. The crop is liable to great injury from defects in the soil, from disease and from insect enemies. 3,000,000 or 4,000,000 bushels is the yearly crop in our State and it is much larger in some of the others. The United States census puts the crop of 1880 at 169,000,000 bushels. But on different farms the crop per acre is widely different—from 50 to 400 bushels are common variations, and there are many cases in which the crop is an entire failure. These differences should and can be overcome. The question is one that is fairly within the field of an experiment station.

"Can the experiment station find a remedy for the disease which comes to the soil in which sweet potatoes have been grown for several years in succession?" Some of our best soils will no longer grow this important crop. In our State the census of 1880 gave us 2,086,731 bushels, and the crop of the United States was 33,378,693 bushels. A remedy for this disease would be a great gift to practical agriculture.

"Will the experiment station help to find out some application to the soil which will enable it to grow successive crops of cabbage, turnips or radishes on the same ground?" At present, in most soils farmers can grow neither of these crops successfully, oftener than once in four or five years. These are market garden crops in popular estimation, but a very large area is given to their production in the vicinity of all our cities and towns. And this failure in the soil and some insect depredations have so damaged the crop, that in some seasons, cabbage has been brought in from Europe.

"What can be done to cure clover sick soils?" This crop so important to good farming, is getting to be an uncertain one, and on some of our best and longest cultivated soils, a good crop can rarely be grown. Our best farmers try to get it once in every four or five years' rotation, and the failure to get it carries also the failure or great diminution of the succeeding wheat crop. The question has long baffled good farmers, but it is fairly in the domain of experiment stations.

"Can anything be done to give uniformity to our cranberry crop?" The normal crop of this country is at least 500,000 bushels;—but the ravages of insects, aided perhaps by some other causes have in some years reduced it to 100,000 bushels or less. It is a very desirable crop, bringing from $2 to $4 a bushel, and a uniform supply would be useful, both to producer and consumer.

There has come to our country from Europe an insect which is doing great damage in the cabbage fields. It appears as a white butterfly, but in one stage of its growth it is a ravenous worm eating holes in the leaves and penetrating to the middle of the heads, rendering them unsalable and worthless. Much has been written upon it, and many experiments have been made—but requests for relief still come to the station.

The grape growers are asking for the aid of scientific experiments to determine the causes of rot and of mildew, upon the products of their vineyards. This industry is a very large and growing one.

The owners of peach orchards are asking for the means of curing the yellows in their trees, and of giving healthy growth and long life to them. In some districts this crop is a leading one, and the great drawback to its profits is the early failure of the trees. The entire prevention of this is certainly within the bounds of scientific investigation and practical skill.

Questions in regard to the purity and richness of milk are constantly coming to the station both from the producers and the consumers of the article. Very stringent laws in our eastern States have been made to protect consumers from the frauds which it would apparently be so easy to practice upon them. Fines and punishments for the violation of these laws are heavy and severe; and if the damages to honest men only are considered they are arbitrary and unjust. But the immense quantities of milk carried into the towns and cities, and the frequency with which adulterations are practiced. make a rigid inspection necessary. There were 750,000 quarts of milk carried daily into the city of New York, during the month of July, 1887, besides all the cream and condensed milk. This represents the product from 100,000 cows, and a value of at least $25,000 to the farmer. In the other cities and towns of our country the product is proportionally large. It should furnish a large element of the wholesome food of the millions who buy it. Our New Jersey State law requires that all milk offered for sale shall contain 12 per cent. of solids—and any which contains less than that amount shall be at once thrown out of the cans, and the seller of it fined $50. And the law is enforced. Under these conditions it becomes important to know what the farmers can do to ensure this degree of richness—what effect will different kinds of feed have on the quality of the milk—what breeds of cows will best supply the proper richness of milk, and the largest amount. The subject is of such immediate and practical importance and the points to be determined are so nice that a large amount of most careful and long-continued experimentation is needed to properly adjust it.

New crops are coming before the agricultural community, and inquiries are being received as to their value and the proper manner of growing them. In our thickly-settled eastern States where the soiling of cattle has come to be a necessity, there is a constant inquiry for the best and most seasonable green crops for this purpose. The reports of the growing of alfalfa or lucern in the Pacific States has revived an interest in it, and an earnest desire that it with its valuable qualities should be shared by our eastern farmers. It grows rapidly, and in its successive cuttings during the season will give a very large burden of fodder of a superior quality for milch cows. When well started it will continue for 8 to 12 years. There are difficulties attending its first cultivation, and the majority of farmers have failed to make it a success. But the large returns which have been secured by those who have perserved, give assurance that when its cultivation is settled by proper experiments, it will come into general use and prove a valuable addition to our farm crops.

The production of sugar from sorghum has been a subject of discussion and of many experiments for several years past. And the supply of this almost indispensable article of food from our own farms, is a matter of national importance. That it can be produced in paying quantities is now proved beyond question by many experiments. From a half ton to a ton of good cane sugar and from 50 to 150 gallons of molasses have been made this year from the crop grown on an acre of ground, besides 20 or more bushels of seed, which is as good for feeding, or for manufacturing as the same quantity of Indian corn. To reach this result has cost a large expenditure of work in the laboratory and of experiment in the field and the sugar house. To find the stage of growth when the sugar in the plant is a maximum, to get it all out of the cane, to keep out the damaging effects of the leaves and seed, and to make the sugar in a house not requiring a large capital to build, and to do all this while the price of sugar has been unprecedently low, has called for a great deal of intelligent persevering experiment, but it has been done, and the results this year have to a great extent confirmed the expectations of its friends.

Questions connected with the tillage of the soil, its amelioration, and enrichment are constantly being presented, and it must be the work of the stations to investigate and if possible to give the correct answers to the practical farmer, and also to ascertain, as far as possible, the scientific principles which underlie them.

These questions are only a part of those brought to our station for solution, and probably every station in the country has had an equal or greater number of questions, the subjects varying with the conditions of markets, soil and products of the several states or localities.

With so many and such comprehensive questions, no station is prepared to deal at once, and the inquiry must at once be suggested as to what limitations can be put upon the work to be attempted.

The answers expected and the quality of work required by these questions are such as can only be given by specialists educated and skilled in the various department of science to which the several questions relate. They need men skilled in chemistry, in natural philosophy, or physics and in natural history. They need botanists, zoologists, mineralogists and geologists, men who specially devote their time and talents to the study of the lives, the diseases and the influences of circumstances upon the vegetable and animal world; and of the effects of time, tillage and additional elements and agents upon the soil and the mineral world. And having ascertained the correct answers, it needs experience and good judgment to put them in form for successful application by practical farmers.

If the answers to these various questions depended upon a single station, most of them would need to be held for a long time. But the multiplication of stations certainly gives hope that by correspondence and agreement among the different ones, the questions which are asked in one State may find an easy and ready answer in another.

In selecting subjects upon which to work, some must be of such a character that results can soon be reached, and made known to those interested, to the farmers, so as to keep them in sympathy with the work which is being done. Others may be undertaken which are necessarily slow in their results and possibly liable to many failures before success is reached. Subjects of the latter sort, while they require the greatest ability and most patient and long continued study and offer the greatest attractions for new and original work, are subject to too many disappointments and delays to be the only or even the most conspicuous objects of any station.

As a speech must be adapted to the audience to which it is addressed, so the work of experiment stations must be adapted to the wants of its constituency and to the condition of its practical agriculture. And it will succeed best when its results can be at once taken by intelligent and skillful farmers, and put to the test in ordinary farm practice. The man of good sense who is brought up on a farm and is familiar with its peculiarities of soil, fertility and products, with its relations to the seasons and to markets, can do much better economically than the specialist of the experiment station can. Besides the real work of the station is to put the farmer in possession of the material which has been worked out. In our State we have aimed to bring the farmers in as active assistants in reducing the principles which may be settled to practice. We have assigned to them distinct experiments upon various crops, and with different fertilizers. And we have located the experiments upon the different classes of soils in the State. Already we have secured some excellent and reliable men, whose reports are bringing in most satisfactory accounts of the work they have done in this line. Such experiments are an advance upon the experiments attempted by farmers working alone, or without the precautions needed in accurate research. The accurate measurement of land, the weighing of manures, the careful saving and separating the different plot-products, the weighing and measuring of grain, straw, stalks, &c., and from all these, and the careful record of them, with their dates, deducing a conclusion of which they are sure, is new work for most farmers; and there are many failures from not attending to all these necessary conditions. But it is introducing new methods of work among those engaged in the operations of the farm, and awakening a lively interest in the minds of many who have heretofore been content to follow in the footsteps of those who began in our new country, and had not the appliances of modern times nor the spur which the competition of the whole continent now gives. And best of all, it is increasing the number of intelligent and skilled men to supplement and widen out the work which is at first limited to the experiment stations' corps of investigators.

One of our county boards of agriculture has already taken upon itself the duty of conducting experiments upon a subject in which the common interests of its members are concerned. They have defined their question clearly, have asked the station to prepare a plan for experiments to solve it, and have selected a number of representative farmers from their members to conduct the experiments according to our instructions. We gladly join them in this, and conduct a similar series of experiments on our own farm. The trial plots of ground are laid out and the experiments are in progress.

Another kind of experiment is being carried on by a large body of grangers in concert with the station. They have bought in very large lots, the separate materials used in compounding complete fertilizers, making their prices and payments to depend on the purity of the materials as determined by the station's analysis. The different local granges agree upon formula to be followed in mixing their goods, which are intended to be adapted to the peculiarities of their soils and the crops to be grown on them. By this plan of proceeding they assure themselves of the quality of their fertilizers, they can get some idea of the influence of the several constituents of the compounds, and they get them at a much less cost if the business is well managed. Such cases as this show the progress making among farmers themselves, and the active interest which is being developed among them by the continued distribution to them of the accurate information worked out at the stations where full records are kept of weights, measures, temperatures, dates, and where other essential particulars are given with scrupulous accuracy.

Other offers of coöperation with the station have been made, which may be taken up at some future time. These give most satisfactory evidence that experiment stations are educational institutions. They teach the farmers who are now in the field how to economize their resources, to increase their products without increasing their labor, and in a time when the prices of products are diminishing and the cost of labor is increasing it is the most promising way of meeting this threatening condition of agricultural affairs.

The establishment of the experiment stations, with their practical work, as contemplated in the present United States law, will help to solve the difficulties connected with the agricultural colleges and the education of those who are to be farmers. The questions asked of the stations by those now in active work, are all upon special topics, upon chemistry, mineralogy, botany, upon vegatable physiology, upon veterinary science, upon entomology and in general upon subjects which require the attention of those who have made a single branch of science their study. They do not ask questions upon those particulars of farming, such as the killing of weeds, the handling of manures, the milking of cows, the growing of horses, the processes of plowing, harrowing, seeding, cultivating, haying, harvesting, &c., though these make up the largest part of farm work. These can all be done by uneducated and low-priced labor. Farmers know that they can instruct their sons or their pupils in such work better than any agricultural college professor can.

Bulletins containing accounts of work done at the stations are printed and sent directly to all farmers who wish them. Of the thirty-four thousand in New Jersey, seven thousand of them are supplied with these bulletins. And their influence is most perceptible and salutary.

The colleges are to educate the sons of farmers and all others who wish to engage in industrial pursuits, in those branches of science which find their application in the various departments of industrial life, and which will enable them to apply the principles they have learned to the saving of labor, the economy of time and materials and the increase of products. The main point is that the education shall not be such as to make manual labor discreditable, but such as to exhibit its influence and profit in the world. Practical operations on farms, or in shops, or laboratories must be provided so that none need forget how to use their hands effectively, but they need not be schooled in the simple labors of the farm, and they cannot remain long enough to appreciate the real skill and ability required in profitably conducting a farm. That is best learned at home and under the eye of a skilful and successful farmer.

And here the real usefulness of the agricultural experiment station comes to the progressive and working farmers. It furnishes the materials and data upon which they can work. It gives them tables showing the composition of rocks and soils, the composition of the plant and animals grown on the soils, the waste that goes with the products sold from the land, the composition of the manures needed to supply the waste, and to add to the fertility of the soil. It gives tables of the elements in the fôod of animal, and the materials from which they may be most cheaply supplied. It gives the result in figures of carefully conducted experiments, in destroying insects, in growing crops and modifying their properties, in feeding animals for the butcher, the dairyman, the stock grower, or the manufacturer.

FRUIT GROWING FOR PROFIT AND PLEASURE.

By HON. GEO. D. STITZEL, *Member from Berks, Reading, Pa.*

Fruit growing has become such a business in this country that we are apt to regard it as a matter of dollars and cents, rather than to consider the pleasure to be derived from it as an occupation. When a few years ago my friend Thomas Meehan was announced to deliver a lecture on " Profit and Pleasure in Horticulture," a newspaper reversed the terms and gave it as " Pleasure and Profit." This led a farmer to remark that it was " putting the cart before the horse," as profit should stand before pleasure. " We have," said he, " to scratch for a living first, and after we have made a living, we can have our little pleasure grounds and gardens." Mr. Meehan, however, thought that the newspaper, although misquoting the title, was not far wrong, for, in the language of another farmer friend a man was but " a poor shoat " who took no pleasure in his business.

In fruit growing as in everything else no one can expect to succeed who does not take an interest in his business. There is a certain pleasure connected with the raising of fruits, which will compensate for the loss in dollars and cents wheñ the crops prove a partial failure. It is not alone by the money which is made, but also by the money saved, that the profits of a pursuit should be estimated. A good part of every rural establishment should be devoted to fruit. Having an abundance of fruit for home use, a family will not be so likely to run into the error common in this country, of eating meat in too great a proportion for their health. Nothing connected with the tilling of the soil is more delightful than to note the progress of fruit trees planted by the cultivators own hands, to watch their first productions, and to be always gathering some fruits from them, and at the same time to behold others ripening.

The abundant production of fruit affects the consumption of other articles of food to an extent seldom noticed. It cheapens the staples of life by supplying a more agreeable, wholesome and sanitary substance for human food. The growing of cereals and esculents, of flesh and dairy products, may form the basis of civilized subsistence, but the cultivation of fruits, ameliorated and reclaimed from the wild state by the hand of science, marks an era in the intellectual progress of any people.

Ordinary agricultural pursuits are being gradually elevated by the diffusion of knowledge; yet fruit growing has more direct claims to being regarded as the most refining among all rural occupations. At the same time, its financial aspects are becoming more important, as the means and appliances for preserving and utilizing fresh fruits are being introduced and extended, and as new fruits are being brought into requisition for supplying every portion of the country.

The demands of civilization and the promotion of health, comfort and longevity, call for a greater abundance and more free use of fruits. It is this free use that can alone secure a continuance of the profits of the fruit growers. The effect of a year of cheap fruit is noticeable in the following season, when the crops are not so good by the increased demand, a larger number of people having acquired the habit of using fruit. In fact, to families who have once become accustomed to its use, fruit becomes a necessity, and is no longer a luxury. And as the demand, so the prices of fruit become permanent and paying.

The recent throwing into the ocean of thousands of crates of southern fruits and vegetables, to overcome the glutted condition of the markets of New York was a mistake, for the reason that it would have been better to have disposed of them to the public at any figure than to endeavor to keep up prices by producing a scarcity. Families who would have been induced to buy by reason of the cheapness of the articles offered, would have been tempted to invest again, and with larger sales and increased consumption the danger of a future glut would have been avoided.

Having shown that the profits of fruit culture depend upon the consumption, and that increased production would have its effect in promoting a healthy demand, we would encourage farmers to devote greater attention to fruit growing, whether it be for profit or pleasure. The surplus crops can always be disposed of, and the engaging in the raising of fruit for market may prove the most profitable branch of the farmer's occupation. Professional men, merchants and others who have engaged in fruit growing in a small way, originally for pleasure, have finally obtained such pecuniary returns as to lead them to devote their entire attention thereto, and eventually build up a most profitable business. In my own county there is a physician, Dr. J. H. Funk, of Boyertown, who by his love for horticultural pursuits was led to plant fruit trees extensively, and as they came into bearing he found no difficulty to dispose of the yield of fruit at remunerative prices. By degrees he became more and more interested in the business until he had many acres under cultivation. A large retarding house was erected upon his premises and by taking advantage of the most favorable opportunities for marketing his fruits he realized large profits. Eventually he found it necessary to abandon his profession of medicine, and is now engaged in a business which not only affords him handsomer returns, but which has a pleasure connected therewith not to be reckoned in dollars and cents. Last year this gentleman's crop of strawberries amounted to over six hundred bushels, marketed at 15 to 20 cents per quart, and there is a prospect of a still larger crop this year. My predecessor in the office of president of the State Horticultural Association, Mr. Edwin Satterthwait, of Montgomery county, has acquired a reputation as one of the most extensive and successful fruit growers in the country. Satterthwait's choice fruits are known to every family in Philadelphia and are marketed in such condition as to always command the highest prices. It would be supposed that Mr. Satterthwait had been brought up to fruit culture from early youth, but such was not the case. He was educated for mercantile pursuits, in which he was interested for many years, until his love for horticulture, and especially the pomological branch, caused him to relinquish the business of the city for the more pleasant and at the same time very profitable industry in which he is now engaged. The pleasure, therefore, which any person takes in raising fruit, though it be but for his own use, will bring its just reward, and lead to financial results which in the beginning were never anticipated.

Said the late Marshall P. Wilder, in an admirable address before the American Pomological Society, at the eighteenth session, held in Boston in September, 1881, which I had the pleasure of attending: "By the better knowledge in the keeping and packing of fruits, and the facilities of transportation, our markets are now supplied with fruits through the whole year. Instead of the strawberry for three or four weeks, as formerly, we now have it for four or five months—the peach from four to six months—the grape from six to eight months, the pear from eight to ten months, the orange and the apple the year round, and the smaller fruits in their season; so he who has the means may replenish his table daily with such variety as no other nation can produce. The progress of invention, the developments of science, and the spur of enterprise are indeed grand in other departments of industry, and in all these the fruit culture of our country is to have its share. Like the light of American civilization that first dawned on our eastern shores, and is now spreading its benign influences throughout our land, so the genius of American Pomology, which a hundred years ago had scarcely emerged from her Atlantic birth place, has now winged her way not only from the north to the south, but over hill, valley and mountain top down the golden slope, there to revel in the fruits of almost every climate on the globe."

The future of fruit growing in this country is undoubtedly bright, and while there may not be fortunes for everybody, there is pleasure for all who embark in the pursuit. The real, grand, aggregate profits of any horticultural product are not found in the larger commercial transactions, shipments, commission sales, and fancy prices of rare fruits, but in the universal use and home production of any given article. The fortune sometimes made from the sales of fancy breeds of domestic animals, etc., in no just sense represents the value of those improved breeds to the masses of producers. The large profits occasionally made from successful orcharding in favored localities, are no criterion as to the profits of fruit growing. In fact, the thorough discrimination and abundant production of any fruit of general use are even sometimes regarded as a failure, or an evil, by the aspirants after fortunes through fruit growing. "No profit in fruit growing" is frequently the cry, when not one family in ten are supplied with fruit at all.

Much of the pleasure in raising fruit is due to the testing and originating of new varieties. Much can be accomplished by hybridization, the principles of which are to many unknown. While the pleasurable anticipations of the grower are not always realized, we should not be discouraged. The introduction of any valuable new variety, is worth years of patient care and development. Ordinarily for distant or home markets only those varieties are grown which promise large profits, and the professional orchardist does not find it desirable to have his lists burdened with many kinds. An esteemed friend, Christopher Shearer, of Tuckerton, who raises fruit for market, finds for instance, that the Baldwin is the most profitable apple, and the Bartlett the best selling pear. He, therefore, grows these varieties almost exclusively, just as some grape growers still adhere to the Concord as being the most popular variety for general market purposes. Nothing can be more annoying or embarrassing to those desirous of making valuable collections of fruit trees, without any previous personal experience, than the interminable lists as found in the catalogues of the nurserymen and the indiscriminate praise bestowed upon all varieties mentioned therein. Yet of the many varieties of apples, and equally great number of pears—of the vast collection of peaches and cherries —there are but few of superior quality, and these few, judiciously selected, will amply suffice for all purposes. Location and soil have much to do with the selection of varieties. The late Charles Downing, who described all the fruits known in this country in his large octavo volume, acknowledged that the entire list of fruits would dwindle down to some fifty or sixty sorts that would prove sufficient for the luxury of any man. Therefore, in growing fruit, whether for profit or pleasure, exercise good judgment in the preparation of your list, and rest assured that everything else desirable will follow.

POSSIBILITIES OF FRUIT CULTURE IN PENNSYLVANIA.

By H. M. ENGLE, *Member from Lancaster.*

This title does not imply that our State does not already produce large quantities of the various fruits; yet the consumption within the State is much larger than its production, which proves its dependence on other States for what might as well be grown within its own borders.

I regret not having accurate statistics to show the amount and value of fruits imported from other States, but am safe in saying that tens of thousands of barrels of apples, hundreds of baskets of peaches, millions of quarts of berries, and grapes by the ton, are brought into our State annually to supply its deficiency. The truth of these statements can hardly be doubted and this being the case, the question will naturally arise, "Can sufficient fruit be grown within this State to supply its population without interfering with other branches of industry?" I answer emphatically, yes.

The strawberry can be grown over a larger extent of territory and on more varied soils than any other desirable fruit, and on soils well adapted, with proper management will produce crops that should be satisfactory to any reasonable grower. Raspberries and blackberries are more partial to certain soils and localities but the most desirable varieties usually well repay careful treatment.

The currant is, perhaps, the most neglected of all planted fruits and that it has not entirely succumbed to mistreatment shows its tenacity to life. Most gardens have some currant bushes which are generally allowed to struggle for existence, yielding crops which are inferior in quantity and quality; but wherever suitable attention is given them they bear regularly and abundantly, and the late introduction of improved varieties has made the currant worthy of attention which has heretofore not been given it. Why the demand for acid fruits in season has not brought the currant into commerce like other small fruits is doubtless due to the fact that every homestead having a few rods of ground, has a few currant bushes, which is not the case with other small fruits.

Grapes also, are somewhat partial to certain soils, but like the currant, a vine or two is seen on most homes throughout the State; and although there are thousands of acres upon which grapes could be grown profitably, it is only in the section bordering on Lake Erie that they are grown for commercial purposes to any great extent. One advantage of grape growing is that they do not need to be hurried to market and disposed of at once like the smaller fruits.

There is no more desirable fruit in its season than the peach, which thrives on a wide range of territory, yet is quite unsuited to certain soils and locations. Heavy clay soils are not adapted to peach culture, though now and then fair crops are produced on such soils that do not lie too low, and where the temperature does not fall below 8° Fah. below zero. Sandy loams, gravel and slate soils on elevated locations, and mountain slopes where the temperature does not fall below 8° or 10° Fah. below zero, can generally be depended upon to grow peaches, and of such soils we find thousands of acres in this State.

The impression is too common that New Jersey, Delaware and Eastern Maryland must be depended upon to supply this State with peaches. It is high time that this mistaken notion is dissipated, and some of our soil, capital and labor be applied to peach culture.

Formerly the surplus crop from the States referred to was mainly shipped to the large cities east, but of late not only car loads but whole trains of peaches have been shipped into almost every county of our State; into counties which might produce not only a supply for our State, but as many more to ship into sections not adapted to peach culture.

The following indicates what may be done in this direction: Some twelve or fifteen years ago two gentlemen from Juniata county (Smith Bros.) came to my place to buy a few hundred peach trees, at the same time asking minute information as to the management of a peach orchard, not having had any experience in the business. They have since planted thousands of peach trees, and are now among the most extensive and successful peach growers in this State. Some of their most profitable orchards grow on land valued at $15 to $18 per acre. For several years they have been shipping their fruit into neighboring counties during the height of the season, but when the eastern peaches were about over they shipped their late peaches by the car load to Philadelphia, receiving the highest market prices for them. Previous to this I had an interest in a peach orchard in Franklin county from which car loads of peaches were shipped to Baltimore at paying prices. What has been done in Franklin and Juniata counties, and much more, can be done again in a dozen or twenty other counties of this State if similar enterprise were applied. Late peaches especially could be made a profitable crop.

Cherries usually succeed wherever peaches do, and will bear a lower winter temperature than the latter, especially the Dukes; and as the trees are comparatively free from disease, there is a wide margin to extend the growth of the finer varieties with profit.

The apple is the most important of our Pennsylvania fruits, being more extensively grown than all others; yet as there are comparatively few orchards planted for commercial purposes our markets are largely supplied from other States. There are, of course, many orchards throughout the State which produce in the aggregate quantities sufficient to supply the demand to some extent, but the great mistake in planting orchards, large and small, has been in having too many varieties, from early to late, good and bad, which prevents dealers from purchasing, consequently many go to waste, which would otherwise find a ready market. In other States, where apple growing has been reduced to a system, large orchards are planted with but few varieties, thus making it possible to supply in quantity the particular kinds wanted in different sections. Why should not a similar system be followed in this State? There is no lack of lands in this State which are well adapted to apple culture and which can be made to supply foreign as well as local markets.

Many of the valleys of Central Pennsylvania could be made more profitable than by ordinary farming, by diversifying the products, among which fruits might be made an important factor. But thousands of acres of mountain lands which do not pay interest and taxes, can be made valuable in fruit culture, and especially in growing apples. Nut culture, which is just in its infancy, is destined to be a matter of increasing importance. They should not be grown as a mere luxury, but as an article of food.

The chestnut, of which there are now large and productive varieties, and of excellent qualities withal, is perhaps the most important and desirable, and there can be no doubt that there will be valuable varieties added from time to time, and that when these improved varieties are better known they will be planted in large quantities as fast as trees can be procured. The great lumbering regions of our State are being rapidly exhausted of their timber, and why not cause at least part of the same territory to yield an equivalent from other resources? The question may arise, would not the course suggested lead to overproduction with consequent loss? The indications at present do not point that way since our population is increasing rapidly and shows an increasing tendency toward more of a fruit diet. Now, what would be the result if my ideal were realized? The benefits would be manifold. It would make our State well nigh independent in the matter of fruit supply; it would enable capital to add wealth to our State by creating a demand for more labor; and, more than all, it would indirectly result in good through the inevitable tendency to an increased use of fruit as food; a desideratum for the better health, and consequently for the greater happiness of our people. Is this an end to be hoped for? Then it is a result to be worked for; and, apart from the satisfaction of receiving a just return in dollars and cents, is the comforting knowledge that in so far as the work results in good to the commonwealth, it becomes a labor of love.

SILOS AND ENSILAGE.

By W. D. Hoard, Esq., *Ft. Atkinson, Wisconsin.*

(An address at Washington meeting.)

The president desires me to talk to you a few moments on the question of silos. I don't know that I can do any better service or better work in this line of thought, than to simply narrate to you what our experience has been in Wisconsin. Wisconsin is a State which has been making very rapid changes in the character of its agriculture. In 1870 it had just emerged from a debauchery of wheat growing, which had left it with an exhausted soil. Its production of wheat had run down to eight bushels per acre. The industry and the energies of the farmers were all prostrated. The condition of affairs was just what the last speaker has prophesied will be if certain things take place. An effort was made at that time to induce the farmers to change the character of their agriculture. I was somewhat interested in that, and commenced dairying in 1870. The result in ten years can be typified by the condition of my own county. In ten years the increase in the farmers who were depositors in the banks of the county was as seventy to one. There were seventy farmers who were creditors of the banks of Jefferson county in 1880 where there was one before. But we had not proceeded far before we were confronted with another problem; and that was the production of substitute butters, —fraud butters,— hog butters. If the president will allow me the digression, I will say here you wool men can very profitably study the method the dairymen put forth to throttle the anaconda that was winding its coils around them. I was the first to start the cry, write your congressman a postal card. And in my letter I sent it broadcast, —the simple little injunction, write your congressman a postal card. The congressman of our district said, "For Heaven's sake let up; I am being snowed under at the rate of a bushel a day." Other men said, " We can't stand this." You see it put the congressmen where they were compelled to take action. There is a tremendous power in the expression of the public, but they won't half the time express it; and you can't blame Congress for being in ignorance half the time.

The depression of the dairy interest came about by two causes: first, the introduction of substitute butters, and, second, the increase in the cost of production. Our lands grow more costly constantly; that of course, compelled an increase in the capital involved. And the increase of the cost of production compelled us to survey the question from another standpoint. We found we were imposing a drain upon ourselves by our own ignorance of the cost of production. Now, the question arose blankly before us, what should we do to produce a cheaper ration? How can we cheapen the cost of supporting a cow for a year? Now, that was the simple question. In 1876, in conjunction with a friend, I sent to Paris and got the plans and drawings for the construction of a silo, and we went to work. One or two, I think, had been constructed east at that time by Dr. Bailey, of Massachusetts, and some others. Our efforts were rude, our progress in the matter was evolutionary. We have learned more concerning ensilage in the past year than we ever learned before in its history. Now, it will simplify matters by my giving you our present method of constructing a silo, and of growing fodder and the principle that lies under its successful conduct. Let me observe, for a moment, the mischief with us all is a lack of study concerning principles; we do things on a farm mechanically. Almost every man thinks he can inherit what his grandfather knew. They tell us the horse inherits his instinct; that he shrinks from the lion to-day because of his instinct; the reason he is afraid of the lion is because he has inherited the horror. We need a knowledge of principles. My little boy is attending school; he has just entered upon the study of mental arithmetic. I picked up the book one day and said, "Charles had five potatoes and Thomas seven, Henry nine and William eleven, how many had they all?" "Father," he says, "don't it say apples?" "Yes sir." "Oh well," he says, "I can do it if it is apples, but I can't if it is potatoes." There are a great many children of larger growth to-day, farming in just the same way, without any knowledge of principles,—they can do it if it is apples, but they can't if it is potatoes. Now we need, in this matter, the study of principle. We will start with the building of a silo; our latest judgment on that question is this, that stone silos are not the most profitable, that the wooden silo is the best. We construct it in a convenient form; it costs about a dollar a ton. If it is intelligently constructed, in Wisconsin, it can be built for that provided it holds from 175 to 200 tons. The smaller the silo, as a rule, the larger the cost per ton. We start to construct a silo thirty-six feet by sixteen wide. Remember that silage weighs forty pounds to the foot, that fifty feet make a ton, with a silo sixteen to twenty feet deep. Five ton will support a cow two hundred days. So, you can very nearly estimate what sized silo you need to have by taking the number of full grown cattle, and multiplying the number of cattle by five will give you the tonnage required, and then estimate the number of cubic feet at the rate of fifty for each ton, and thus get the size of the silo you want. You should build the silo with due regard to convenience of filling and emptying; it should be constructed so as to insure the smallest amount of labor in getting the silage to the cattle. We find it is an excellent feed for horses, cattle, hogs and sheep. Some of our best sheep feeders in the west are putting in silos for the use of their sheep. You sheep men in Washington county will find it is a very fine thing for sheep. Silos should be constructed with due regard in feeding the cattle. Suppose we have an underground stable or barn, and suppose, for instance, the barn is constructed so the cattle face inward. Now, the most convenient form of constructing the silo in that case, is at the end of the barn. If the barn is on a bank you are bettered somewhat in that particular, because your ingress to the barn is only at the one end. So you have to figure and cut to your cloth, or, in other words, adapt your silo to the necessities of the case. But suppose the barn is open at both ends and the cattle enter at the corners; the silo, then, should be constructed I think in the center of the barn at one end. Then construct a small railway right along on the ground in front of the cattle, for its whole length; make this of straight scantling, if you chose; hard wood will last better, or you may get, if you chose, small iron rails; get a couple of hand-car wheels and make your little car; put upon that car a box sufficiently large to hold the whole of the silage you want for a feed. You have one pit next the barn pit number two beyond that and pit number three further along, and the railway running along under all three of them. Now you build a stone wall, say two feet high, a good solid wall of about eighteen or twenty inches; then you commence with two by eight scantling; shoulder the scantling back say half its distance, so the ends project to the bottom of the wall on the inside; if your silo is twenty feet deep and your wall is two feet, cut the scantling two feet and six inches, shoulder in, cut out, and then the scantling on the inside will run down to the ground with the shoulder against the wall; set these scantling from twelve to sixteen inches apart. Remember you have a powerful pressure as the silage is settled, and you must make the silo strong or it will burst. We have had several experiences of that kind. Then set the scantling twelve or fifteen inches apart straight around, and if you chose, lay a timber 2x5 or 2x8 on the wall for the scantling to shoulder squarely on; put a 2x10 on top for your purline. Make this silo just as cheaply as you possibly can but make it strong. Put on your roof with good boards, if you chose. Fix, if you chose, on one side of it your carrier; it will convey your silage any place you desire to have it. Then fix your partitions in the silo with plank; take ten-foot plank, joint the edges, dovetail them, now pin the plank so they will fit one above the other like that. You divide the silo in three pits twelve feet apart, making each pit 12x16. Now you have got your silo built. On the inside sheet it up with rough lumber, sheeting it horizontally right around. Over that lay a layer of tarred paper, lapping six inches; over that put flooring right around the same way; it is better to have the flooring running horizontally around the silo than running up and down, for the reason that if it runs up and down the shrinkage of the cracks in the summer, after the silage is out will make a convenient air passage through the whole length of the pit; then put on matched flooring on the inside when the silo is built. On the outside board it up and batten it. Now you have got your silo. The partitions run in two grooves like this, on the side; you set two sticks up on the sides and the plank run down between them like that, and you get up these planks one above the other, in your partition, just as you fill up. That is one of the simplest forms for constructing a silo. For the resistance of the lateral pressure you can fix the plank with a hook and staple on the side—with two hooks that hook into two staples at each end; that holds the sides from spreading out. Now you have got your silo built with a due regard to convenience in feeding.

Now about the growth of the corn. We find the best corn we can procure is the Burrows & Whitman corn, grown in Virginia, a large, southern, white corn. The further south it is grown, or rather if it is grown in central or southern Virginia, it does the best results; and we don't want to grow our own corn. By getting it from the south we get all the ripe southern energy there is in it, and as a result we get the first year a yield of from sixteen to twenty-five tons per acre of green silage. Now, I went to the experiment of ripening this corn, saving the seed, one year ago last summer, and planted it, and I saw instantly my mistake; I got a transformed corn and only half a yield from the ground I planted; and in the course of five years it would be nothing but common western corn, in the transformation. We planted this corn five and a half feet apart, dropping with an ensilage single horse planter. I plow the field, preferring clover sod if possible; prepare the ground nicely and drop one kernel every six inches; as soon as possible put the harrow upon that ground and drag it; as soon as it comes up and begins to start with weeds, drag it again; I dragged my corn this year four times. I am beginning to believe you can drag almost anything. The finest crop of potatoes grown in the central part of our State this year was dragged when the potatoes were eight and ten inches high, and they were at that time the scaliest lot of potatoes I ever saw in my life. That man had 700 bushels of potatoes on five acres of ground, and he sold them at eighty-five cents. We go through our corn, keeping it in constant cultivation, planting as early as we possibly can; don't be afraid of early frosts, we say, I would rather have two frosts in the spring as one in the fall. I planted my corn this year on the 9th of May. I think we have a little earlier seasons there than we do further east, although Wisconsin seasons are growing later every year. We calculate to secure, if possible, the formation of a single ear on every stalk; we don't want as large an ear as it would grow if it was planted for field purposes; we want a single ear to start. I want to call your attention to a principle that lies here; there is a principle in everything. The question with us is to secure the largest nutritive ration in this stalk of corn; we want the largest secretion of gums and sugars, and the gums and sugar come through the maternal actions of the growth of this ear. The object of this branch is to produce an ear; that is the great object of its existence; if it don't produce an ear it does not carry out many of the functions that make the nutrition in the stalk. So if we can start an ear on the stalk, it then commences the process of secreting the sugar and the gums of the plant, drawing them towards the ear, and we arrest that at just the right period when they are in the stalks and ear both; if we carry the stalk too far along they are most of them in the ear—most of the sugar is in the ear; if they are dead ripe, the stalk is woody and all the nutritious part is in the ear; but if we allow it to go along to the place when the last increment of the milk occurs, it thickens, becomes farinaceous, at just the best roasting ear stage, we find then both the stalk and the ear is at its highest pitch for nutrition. Our plan now is, and we have gone through many changes in three years, to cut this corn when it is over half grown, as a rule, we usually lay it on the ground; but if there should come a rain storm, a dash of rain upon it, we set it in straight rows for four or five days; in that way we wilt it and enhance the amount of sugar in it; and also we lose about thirty per cent. of the water, and that relieves us very much in handling it. We then draw it to the silo and we cut into it the first day about four to six feet of silage; to-morrow we run it into the next pit and fill that in the same way; the next day we fill the third pit, and then we go back to the first pit and find it has heated up to about 120 degrees. I want to call your attention to a principle involved in this heating. We are making to-day sweet ensilage; I can show you any quantity of silage with scarcely a particle of acid in it. Putting this silage in and letting it remain for three days, by the third day the first pit is heated to about 120 or maybe 140, if it is warm weather. That heat kills all the germs of ferment in that batch of silage. Now, what are the germs of ferment? They are what in the end produce fungi or mould.

I said yesterday, your mother, if she wanted to keep the milk from souring, heated it and set it away and let it cool; the heating of that milk will kill all the germs of ferment there are in the milk. Now we do the same thing with silage; we heat this up gently, we don't tramp the center, we tramp the edges and leave the center untramped; but it will settle down fast under these circumstances, and you will be appalled at the amount of stuff it will take. Then we put in another batch of four to six feet of cold silage on top, and that checks the heat in the lower layer; it never reaches any higher afterwards and the heat is transferred to the layer above, and that in turn takes on the same process of heating; that prevents it from passing to the ascetic state of fermentation. So it remains sweet and the air cannot come back to it again to set in fermentation, because it has been checked at 120, and it sinks down to about eighty-five and there it remains, the second batch takes on the same heat and the third batch and each cold batch checks the lower one at between 120 and 140, and we find the ensilage comes out in the winter time about the color of tobacco and sweet. And we have by the maturing of the corn, by letting it stand about forty-eight hours before putting it in the soil and by the heating, we have by these two processes turned out the best silage, and from thirty to forty pounds of silage will be sufficient for a cow of one thousand pounds weight. I said yesterday it became a matter of great importance to me when I reduce the cost of my ration from sixteen and seventeen cents a day to eight. This is the way I do: My ensilage costs me two cents and a half a day per cow. Now you go on up with this ensilage in this manner and keep filling in until you have filled your silo to completion, treading in the edges and corners constantly to keep them right. When you have got it filled you rake it off and smooth it. To-day we are not weighting; to-day many of our best farmers are not putting boards and plank on top. When you have got it filled go around the edge and beat it down eight or ten inches and set up this tarred paper right around the edge of the silo lapping it about six inches on the face letting it drop down the width of the sheet about eight inches into the silo, and there it stands all around in this way. Then you take green marsh hay, or any other kind of rough stuff you have got and cover it with that about six inches deep, then turn the paper right over on top of that. First, I forgot to say, you put the silage back again and tread it down. Put on your green grass, say six inches deep, turn the paper over and lay a layer of paper right over it lapping it over just about six inches: then throw on that a loose mass of, say, five or six inches more of either hay or chopped straw, or anything you choose, and let your silage alone. Now we find that boards on top being stiff, you know a silage hardly ever settles evenly, it will settle more in one place, and the boards will lift up and there is a ridge on top and don't fill the conditions of a silo. So we find we want a flexible top that is air-tight, and the tarred paper answers the purpose. I was present this winter at the opening of about forty silos. I furnished last year about sixty plans for men who would write to me for plans for building silos and barns, and they would write to me I am going to open my silo such a day; I want you to come and see it. In only one or two cases did I find, where the silage was put in in this way, any injury at all on the edges or on top, and in every instance where there was injury, it was because the farmer would not pay the price. You know this mysterious old notion we have, "I guess it will do." It don't do, and so it is with all these matters. Remember in building silos and filling them up we are dealing with chemistry, and chemistry knows no favor; it will be obeyed or it will produce its results; if you want it to produce its results favorably you must obey it. So in all these things we must have a clear head, all the time, as to what the principles are. In taking out this silage, we uncover the top of one pit; take it all over. The convenience of having two pits is this, you are obliged to uncover a smaller portion of the silo at a time. We take a common hook, such as we use for unloading manure, and rake it up on top; it has settled down; it is solid. We rake it up on top and pitch it along to the front and throw it onto this little car that stands right at the foot of the silo on the little railway. The cattle are on beyond and we throw on what we want for them, and it comes out of the silo nice and in good condition, and the cattle receive it thankfully and give a plentiful amount of milk, and it costs but two and a half cents per day. That in short is the process we have gone through. One or two points we learned this winter I will speak of. The cry comes all the time from the farmers, why 'aint the Dent corn or the common corn just as good. You know we are a speculative set of fellows. Now Prof. Henry built seven silos this winter and experimented with seven different kinds of corn. Now this question has come to the front. I had often talked with Mr. Henry and last fall I said to him, I believe I can prophesy the outcome of the Dent corn. Why? Because I don't believe it will be hot enough; it hasn't sugar sufficient to carry the heat high enough; it must pass 120 degrees. He opened the silo this fall and found places in it as large as a bushel basket of solid mould. He couldn't carry it above 110 degrees; it would not heat. Why? Because there was not sufficient sugar in it to heat. Therefore you get the principle I am after here. And we find the common lot corn makes excellent silage; sweet corn makes excellent silage; Stowe's Evergreen makes good silage, but the com-western Dent corn is deficient for silage; clover makes good silage, but it is like carrying a rag-carpet to get it out. Some of our men in the State have been experimenting by putting in the corn whole. Quite a number of silos have been running two years, putting in the corn whole, but it is like loading in a lot of fish poles, and it is not convenient in putting it in and taking it out, and the cattle do not eat it all.

ENSILAGE AS A CATTLE FOOD.

By JOHN STEWART, *Manager of the Morganza Farm, Morganza, Pa.*

The use of ensilage is no longer an experiment; the results of its use in Ohio, New York, New Jersey and in our own State, have shown its value and its practicability, and it is of interest to the farmers of Washington county to know the result of our experiments at the Reform School at Morganza. First, as to the construction of the silo: it is built in one end of our cow-barn and is 16x20x32 feet; it is all a frame building with studding 2x10 inches and weather-boarded on the outside with common hemlock boards; on the inside it is covered with two courses of No. 1 pine flooring boards; we have one thickness of tar paper between the two layers of flooring boards; the covering for weighting the silo are made of two-inch plank with screw pressure the same as in an ordinary cider press, the screw being worked by a lever.

The seed corn came from Little Falls, New York, and is white in grain and very leafy in the stalk; it grows from ten to twelve feet high and with a fine ear, and yields about eighteen tons per acre. We plant it the first of May in rows three and one quarter feet apart in the row, and in hills of four to five grains every eighteen inches in the row; when about two inches high it was thoroughly worked with a tooth harrow, and in another was again cultivated well. It was never hoed, and this was all the working that it received. When the ears were large enough for roasting we began to cut and put it in the silo; it was hauled to the barn on sleds; the field was near the barn for convenience sake, but if further off several sleds could be used; it took six men and four boys to keep the cutter going cutting forty-five tons in a day of nine hours; the silo holds one hundred and eighty tons and it took us four days to fill it, and it will feed forty head of cows in the year. The silo cost $350, and is air and water tight; in filling our silo we filled day after day until it was full; to make sweet ensilage it is probably necessary to fill one day and then wait three for it to heat; some prefer to put no weight on the silo, but we prefer a good weight or pressure from the screw; we think the more pressure the better the air is kept out and the better the ensilage keeps. After we open the silo for use we do not put the pressure on again; we can pitch the ensilage out of the silo into the entry near the stables with a fork, and the silo should be so situated as to be convenient to the stables.

Our ensilage was cut in one inch lengths; it should be well tramped at the corners and sides of the silo and the middle will take care of itself. The ensilage we find to be better for milk than hay, and the cows will milk nearly as well as when on grass; it costs us by actual count about fifty-nine cents per ton; a full ration per day to each cow is from fifty to seventy pounds; in feeding ensilage we use four quarts of bran and two of middlings; the yearlings get forty pounds of ensilage and two pounds of bran per day. When we fed hay each cow eat two tons in a winter, and with the usual feed of meal did not do nearly as well as with the ensilage, while the cost of the daily food was eight times as much. All the work being counted at cost our one hundred and eighty tons of ensilage cost us $105, the work being counted the same as if hired. A silo for ten cows should not cost more than fifty dollars, and larger ones in proportion.

In conclusion I will state that the man who builds and uses a silo will save seven-eighths of the cost of wintering his stock, and will keep them in quite as good order, and get as much milk, beef or butter from them. The silo has come to stay. Formerly I thought it the rich man's luxury, but now I see it is the poor man's necessity, and if I only had a farm of twenty acres I would have a silo and keep twenty cows the year through. Ten acres of ensilage will keep twenty cows in all they will eat.

THE PRESERVATION OF ENSILAGE.

By S. M. COLCORD, *Dover, Mass.*

For ten years past I have made a study of preserving green forage and a great deal of my time has been spent in visiting silos, and making examinations of their contents. There is a great deal of truth in the claims made for ensilage, especially in the direction of assimilation in the digestion of food, analogous in some degree to the difference between grapes and raisins or between green and dry forage.

There is also a great deal of truth in the objections made to ensilage as usually fed to cattle, especially in the direction of its being injured or spoiled by heat and fermentation in the silo, rendering it unfit for wholesome food. It has been found so difficult to preserve it without heat and consequent fermentation, that the advice of scientific men has been in the direction of increasing the heat for the purpose of germinating the bacteria in true fermentation, and killing them by excess of heat; as they germinate at a temperature above eighty degrees, and are killed above 122 degrees. The objection to this theory and practice is that true fermentation cannot be controlled or stopped before the ensilage becomes unfit for food, as it has been proved that the germs of bacteria will develop after having been exposed to a temperature of 212 degrees for some hours.

I have therefore directed my experiments with a view of preventing heat and fermentation entirely, as the only sure way of preserving green forage: and in order to ascertain the possibilities of this system, I built a perfect air-tight silo, with smooth perpendicular walls, capacity of 6,528 cubic feet, about 150 tons, 384 square feet of top surface, arranged to press with jackscrews at pleasure, wherever and whenever wanted, filled it with green corn in full milk, cut in half-inch lengths, leveled carefully to level lines striped around the walls with a plumbago pencil one foot apart, covered it with two-inch splined plank and around the sides with four and one-half inch rubber packing, then covered with two thicknesses of thick paper, kept in place with four inches of sand all over it.

Three governors consisting of one inch iron pipe made into frames six by twenty-six feet, with one-quarter inch holes on the under sides every six inches, were placed at the bottom, in the centre, and on the top of this mass of corn, with outlets at the bottom and top closed with stop-cocks and plugs. These governors were sleeved together and so arranged that the corn could not stop the one-quarter inch holes, but would leave a continuous passage under the pipes for the air and gases to get into the pipes and be conveyed through the pipes to the outside through the openings at top and bottom, thus leaving an air hole within three to four feet of every part of the forage. It is not usual to get any juice from the corn in making ensilage even with 200 pounds weighting to the cubic foot, but with this device the action was so prompt and decided, that I had two to three inches of juice from the corn all over the bottom of the silo, before it was three

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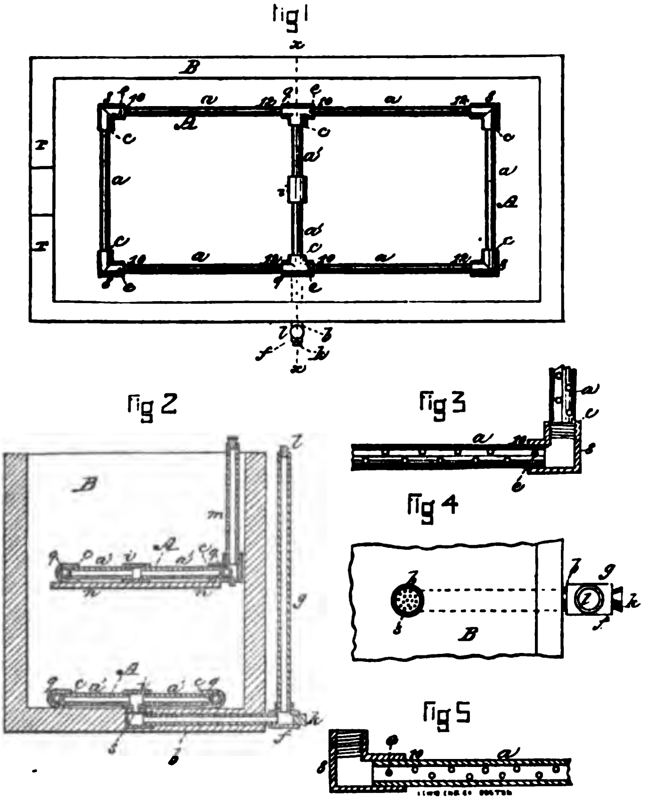
Mr. Colcord, thus describes the construction of his silo governor: I take from pipes *a*, *a′* of any dimensions desired, and join them together so as to form a frame A, with a continuous air connection (which also communicates with the drip-pipe, *b*), by screwing each of the ends of the pipes *a*, and *a′* into its connecting elbow 8 or coupling 9, as shown at *c*. The ends 10 and 12 of the pipes *a* are thrust or telescoped into their connecting elbows 8 and their couplings 9, as shown in Figs. 1, 3 and 5. All the horizontal pipes, except the drip-pipe *b*, which runs toward the side wall of the silo B, are perforated on their under side with holes about one-fourth of an inch in diameter, and about six inches distant from each other, as seen in Figs. 3 and 5; the ends 10 of the pipes *a* are each held in position by a small wooden peg or pin *e*, as shown in Figs. 1, 3 and 5.

A T-coupling *f* is screwed on to the projecting end of the drip-pipe *b*, and the vertical pipe *g* is screwed into the upright branch of said coupling *f*; the vertical pipe *g* affording the outlet or means of escape from the silo for the air and gases. The pipes *a*, *a′*, which extend transversely across the centre of the frame A, from side to side, are screwed into the couplings 9, 9 and *i*, the downward branch of the latter coupling fitting loosely within the upturned end of the drip-pipe *b*. The water, juices, etc., from the ensilage are drawn off when desired through the drip-pipe *b*, the outer end of which is provided with a stopper, *k*; but a faucet may be employed, instead of the stopper, if preferred. The mouth of the vertical pipe *g*, I close with a stopper *l*."



Colcord's Silo Governor.

Fig. 1.—View of the governor as laid on the bottom of the silo, the holes in the pipes being underneath:

Fig. 2.—A vertical section of the governor cut on the line $x. x$:

Fig. 3.—A portion of the governor upon an enlarged scale showing one of its corners, and the air holes in its under side:

Fig. 4.—A top view, on an enlarged scale, of a portion of the bottom of the silo, before the principle portion of the apparatus has been placed in position, showing the upturned end of the drip pipe and the strainer in its mouth:

Fig. 5.—A section of a portion of pipe and elbow, on an enlarged scale, showing the wooden peg which prevents the pipe from turning on its bearings.

quarters full, and some days before it was covered. I took the temperature daily at different depths in the center, which was never over seventy-two degrees in any part of the silo; this was about the temperature outside, when we commenced filling; six feet from the bottom the mercury stood fifty-six to fifty-eight degrees which is above the highest temperature, we now have four months after filling; the forage does not heat up when removed from the silo, piled in a heap and left exposed to the air, as ensilage does.

The silo being sealed up air-tight, all the gas coming from it had to come out through the governors at top. The next morning after commencing to fill, carbonic acid was abundant; the second day we had acetic acid, with no rise of temperature, these two acids appeared to be all that came out of the silo, they were very pure. It is fair to presume that as carbonic acid is heavier than air, and was present in quantity, that it displaced the air in the silo, and that being readily absorbed by the water or juice, it had a tendency to form a vacuum, which combined with pressure and capillary attraction brought the juice to the very top plank. The silo is now just half empty. The pependicular face of the cut is thirteen and one-half feet from any part of this face; we can take a handful of the corn and squeeze the juice from it with one hand. The lower half of this mass occupies less than half the space it did when put in; the upper half shows much less pressure, but the weight of a cubic foot of each is about the same, showing the proportion of juice to corn is much greater in the top half. Heavy pressure was kept on for six weeks; during all this time acetic came out pure and pungent. When that ceased to come the pressure was discontinued, and since the pressure has been removed the acidity has been growing less; a change not unlike the acidity of a Baldwin apple from November to May. My cattle have never objected to the acid, they seem to like it; the good milkers increase in milk, but do not increase so much in flesh, while the young and dry stock increase in flesh, some of them over two pounds daily for sixty days past. I am keeping nearly double the stock of last year, making nearly double the amount of milk and manure, using about the same amount of grain and employing the same amount of help as last year. I have no weights to put on and take off the silo, no corn to husk, shell and take to the mill; it is all in the silo, and have no corn-fodder to handle, cut up and steam, and no mangles to cut up and feed; I shall have half my hay left over, that was all fed out last year to about half the amount of stock. I also have enough of this fodder to carry twenty head of stock to the first of August.

This system as developed by experiment and test rests mainly upon having tight silos with smooth perpendicular, even walls, the opposite walls being at equal distances from each other in all places, so that under pressure the fodder may descend with the least lateral pressure; and the covering may come down evenly without pressure upon the walls; the forage kept spread evenly while being placed in the silo, so that it may be pressed to equal density. The cover should be of two inch plank laid across the silo with six by six timbers laid across the plank lengthwise of the silo to keep the cover level, and the pressure should be upon the six by six timber. The best pressure is produced by having one-and-one-fourth inch iron rods built into the side walls from the bottom to 6 feet above the walls placed perpendicular in the center of walls about four feet from the end walls, and five or six feet distance apart with eight by eight timber to a twelve-foot span, connecting opposite rods, the rods passing through one-and-one-half inch holes through the ends of the timbers, securely fastened on top by double nuts and large heavy washers under them. The long screws on the rods should be about six threads to an inch. Two inch jack-screws should be used between the timbers running lengthwise and across the silo.

The heavy strain upon the rods will assist in holding up the walls, the corn can be kept level, and all time, trouble and expense of weighting avoided.

The corn should be cut fine, one-fourth to three-fourth inch long. The pressure should give about thirty inches of juice in the bottom of the silo, and is a better guide for pressure than weighting a certain number of pounds, because that amount of juice has been found sufficient under pressure, with the absorption of carbonic acid and capillary attraction to carry the juice to the top of the forage, displacing all air and free gases, representing canned goods by cold pressure instead of heat. This statement must be understood to include the device for removing air and other gases, without which it cannot be done. In large silos one governor should be placed on the bottom and one in the center of the silo; these act so promptly that we get juice in the bottom before we get the cover on, and act continuously for six weeks removing air, carbonic and acetic acid, the forage continually improving in quality from the filling to removing it from the silo. The covering plank is laid directly upon the corn. There is no waste whatever of forage in the silo or at the feeding trough. There is no odor from the forage in the silo, about the barn, or from the hands and clothing after handling it. Cattle will eat one ton per month continuously. If the corn is put in mature, the ears upon the stalk, no corn-meal should be fed with it, but they will do better with a light ration of shorts and cotton seed fed with the forage, as corn in its best conditions is not a perfect food, although there is no better food to feed alone.

In comparing different samples of ensilage together, it is often difficult to decide which is best, and it is usually found to be of better quality during the first month after opening the silo, but forage preserved by this system is continually improving.

In comparing it with ensilage, we can feed one-third more of it in a given time. It is much more economical; there is no waste in preserving or feeding it; there are no foul odors about it, and odor is one of the sure tests of quality.

By this system we expel the air, carbonic and acetic acids from the silo pure and simple. In ensilage, these are disposed of by heat and fermentation, through decomposition, forming deleterious compounds with foul odors, increasing as bacteria fermentation is more or less active. Ensilage usually has heat and active bacteria fermentation in it, which causes nearly all the trouble with it, but when the governor is used in a good silo heat and fermentation never occur.

It is of great advantage and a great satisfaction to be able to know just the conditions inside the silo at all times, as the amount of juice gives the pressure wanted as well as the acidity. The temperature informs us as to fermentation, the ability to examine the gases coming from all parts of the silo, at any time, and to know when they cease, and how they can be controlled. The device we call the governor, because it is intended not only to show the conditions, but govern them. It has always acted to prevent heat and fermentation, so that we have never had an opportunity to test in stopping and controlling, although designed for that purpose also.

It is also a great advantage to control the pressure at will, the last heavy pressure by the screws gave us acetic acid through the governor, showing no changes beyond, towards decomposition, and it is to be noted that acetic acid came in the second day from commencing to fill.

The quantity of acetic acid in all samples of ensilage has appeared to be one of the great objections to ensilage, and in judging it, other greater objections have been overlooked. I have found that the quality of the preserved forage does not depend upon its acidity.

To ascertain the effect of good preserved fodder fed in large quantity, I fed to a large cow from sixty-six to over seventy pounds daily for ninety days, during which time she gained in weight two pounds five ounces daily. Her last feed an hour and a half before she was killed was nineteen pounds of bright odorless forage fed alone; the acidity of which was equal to the acidity in eleven ounces of commercial acetic acid. The test was made by pressing ten ounces of juice from one pound of the forage, neutralizing with liquor potash and testing with litmus. The contents of the stomach were immediately examined in the same way. One pound of it was pressed the same as the sample before it was fed, with same results, ten ounces of juice from sixteen ounces. Nothing found in the stomach but this forage; the humidity the same as before being eaten, and tested so nearly neutral that I could not tell whether it leaned to acid or alkali.

The contents of the stomach were not offensive; not more so than the forage before being eaten except the animal heat in it. Every part of the animal was perfectly healthy. The beef was fat, very meaty and well mottled. This cow before she was fed on this forage was in quite ordinary condition, and it was feared that she would not fat enough for fair beef, but three days before she was butchered she weighed 1,418 pounds. How that quantity of acid was disposed of in one and a half hours by the animal will require more time and further experiments. No animal could have been in better health than she was during the ninety days, or show a more healthy condition of every part upon examination. Her gain in weight for the last ninety days was gradual and continuous, averaging two pounds five ounces daily. Over three pounds of the contents of her stomach is now in the same condition as on the day it was taken out. It has been kept in a tin lard pail thirty days, is odorless and seems to be just in the condition for mastication.

This acid forage was taken from the center of the silo around the perpendicular pipes that very loosely sleeved the governors together, giving the forage an opportunity to absorb a larger portion of the acid passing the loose openings. I do not know what the odor of ensilage would be under like circumstances, after being exposed to heat and fermentation, but presume the foul odors would be very much increased, as is the case with juice from ensilage after exposure to the air.

May 15th, 1888. My silo is now three-quarters empty. This empty part is dry and odorless. The last quatrer we are now using is much improved by remaining in the silo; the cover is tight, but there is no pressure or weight upon it. The perpendicular vertical cut is thirteen and a half feet. The lower half of the corn is condensed to half the space occupied by the upper half, but a cubic foot of the upper half weighs a little more than a cubic foot of the lower half, yet in feeding value they are equal. I feed all the cattle with every ration weighed to them, which is now sixty-five pounds daily to each animal, reduced from seventy pounds, because the feeding value is improved by soaking five months in its own juice. The flow of milk is much greater, as well as the gain in flesh. Nothing leaks out or runs down from this vertical cut, and I can now press out eleven ounces of juice from sixteen ounces of the forage taken from any part of the silo. Sixteen of my cows have gained the past four months 2,765 pounds, and sixteen of them 1,242 pounds during the last thirty days. One of them has gained in weight an average of a fraction over five pounds daily during the past thirty days; another one four and a quarter pounds daily, another three and five-sixths pounds, another three and one-third pounds, another three and a sixth pounds, two more three pounds daily each, and so on; all during the last thirty days, with about half my former rations of grain and about one-quarter ration of hay for a change.

The juice from this forage is odorless, agreeable to the taste, and changes but very little upon exposure to the air. It settles clear and loses much of its acidity. At a temperature of 60 to 80 degrees it will gradually turn to pure, odorless, weak corn vinegar.

The year previous to building this silo, I fed at the rate of one hundred and forty bushels of shelled corn in the shape of a mixture of cob meal and oats to eleven cows with good results, but I thought I was feeding too much corn for the health of the cattle. This year I think I am feeding mature corn in full milk that if allowed to glaze and ripen would yield about 500 bushels of shelled corn. This has been and is being fed to nineteen head of cattle, seventeen being milch cows giving twenty cans of milk seventeen pints each, the milk increasing at about the same rate as of flesh, as stated above in the past thirty days.

This amount of corn goes into the cows as juice, or extract of corn, as between 60 and 70 per cent. is contained in the forage as free juice, held there by absorption, and fed in this way, I do not consider that it acts in digestion as corn meal does, and accounts for the greatly increased feeding value of corn forage preserved in this way.

I have not yet tried the experiment of feeding a large quantity of grain with this very moist forage, but I think it can be done to some extent without injury to the cattle. There must be some limit to it, but I have not yet found it. I am not feeding my usual quantity of grain, on account of the enormous increase of flesh as stated above.

If, as these experiments seem to indicate, the first process of digestion is done in the silo to a great extent, and if it is necessary that a large quantity of acid is required in this first process of digestion, and if we can do it as well or better without using the vital force of the animal, it would seem to be a matter of very great importance.

The cattle eat these rations in half an hour. An hour after the cud is in the best possible condition ready to be chewed over. There is no inflation of gas in the stomach, no acid, no odor. The cows are quiet and docile; the increase of milk, flesh and manure is very large. The economy in time, trouble, labor and expense is very great, and the results foot up from double to treble any other known methods.

I have not yet made any experiments for the quality of milk, cream and butter, but I have no reason to doubt a corresponding advance in both quanity and quality. The quantity we are sure of, and the large amount of hydro-carbons that go to make cream and fat are to be found in corn, bran, cotton and flaxseed; these fed with this forage in proper quantities (not large) will give very rich and yellow milk, cream and butter. There is not any objectionable odor in this preserved forage from the silo .to the second stomach of the cow, but it may lack the fine flavor of clover or new-mown hay.

POINTS IN THE PRESERVATION AND USE OF ENSILAGE.

By the SECRETARY.

The interest which was developed at several of the local farmers' institutes held in different parts of the State, notably at Washington and New Castle, shows clearly that, after the reverses which followed the first introduction of ensilage, our farmers are again investigating into its merits, with the view of obtaining some food which will enable them to cheapen their products and more successfully compete with the low-priced lands of the west. Several papers referring to the ensilage question are presented in this report, others were crowded out for want of room, and but a portion of the practical discussions following the reading of the papers can be used. In view of these facts the Secretary has though best to insert, in a condensed form, the opinions of some of our leading scientific and practical experimenters, with a view of enabling the reader to more readily arrive at conclusions.

It will be found, that as is usual in such cases, our authorities disagree, and that the variation between the two extremes is so great as to cause a cautious man to very carefully examine the whole subject before investing in the silo. Since the former failures in the use of ensilage we have however learned one important fact which will in the future save much money, and that is that an expensive silo is not necessary. The experience of some of our own practical farmers clearly proves that a wooden silo, constructed at a comparatively small cost, and placed in one corner of the barn, will turn out as good ensilage as some of the more expensive silos of the amateur farmer.

The claim that equal areas in the silo and of dried fodder have equal feeding value, has also opened the eyes of ensilage enthusiasts to several errors which have had much to do with former failures: *First.* We have sown or drilled the seed too thickly upon heavily manured ground, and as a result we have had large weights of succulent fodder which possessed but little feeding value; the thick seeding preventing the free circulation of air, which in turn prevented ripening and promoted succulent growth. *Second.* That by planting in drills about one-half as thickly or at the rate of a stalk every six to eight inches, we can obtain fodder yielding small and imperfect ears and obtain a crop which, while it may have less of bulk and weight, will contain more of nutrition. *Third.* That in the earlier experiments with the silo the fodder was cut too green, not only increasing the cost of handling but also the danger of damage and loss in the silo.

In fact as is usually the case in all new introductions, we find the truth very near a mean of the two extremes, and that if the fodder is allowed to partially form or ripen small ears, all that is lost in bulk is more than made up by a gain in quality. Those who have fed green corn to stock on pasture are well aware that no matter how grown, it has little or no feeding value until it is fairly out in tassel, and that it cannot be fed with advantage while the pollen is on the tassel; in like manner ensilage cut while in pollen is more or less injured by the bitter dust which falls from the bloom, and which in many of the earlier experiments caused the unfavorable reports of animals refusing to eat the contents of the silo.

At the present stage of the ensilage question we may assume that equal areas carefully preserved in silos and dried as fodder vary very little in their actual food value, and that any advantage in favor of ensilage must be attributed to its value as a change of food, and to the well known advantage of mixing dry and succulent food; in fact we may assume that the best results from ensilage are obtained, not by its entire substitution for hay, but by a partial substitution; it is admitted that as between ensilage and dry fodder the former is, equal areas being considered, more expensive, and it therefore remains for the practical farmer to decide whether the advantage gained will repay him for the increased expense. We must get rid of the idea that the silo by some unknown process adds anything to the food value of the crop; it merely preserves it with the water in its tissues, whereas ordinary fodder is ensilage minus its water. It should also be remembered that all modes of preservation involves a loss of food value, and that the silo is no exception to this rule, but it is also true that the proportion of this loss will in a great measure depend upon the perfection of the silo and the exclusion of air.

After carefully comparing the opinions of scientific experimenters who have the confidence of the agricultural community, and of practical men who have made and fed ensilage, we arrive at the conclusion that its utility for universal use is not yet fully proven, and we can but repeat the advice given seven years ago, to go slow unless you can afford to lose the money invested in silos; it will be safer to commence upon a small scale and enlarge after your own practical experience has demonstrated that it is profitable; the many unused silos in eastern Pennsylvania are a standing endorsement of this advice.

In the following pages we propose to give, in a condensed form, the result of the practical and scientific experience of our correspondents and others, and with its presentation will leave the case to the jury of practical farmers each one of whom must arrive at his own conclusions.

From a somewhat careful review of the data relating to ensilage as furnished by the experience of the past year, we give the following summary:

1. That an exclusive diet of ensilage is not to be recommended and that some of the failures which have followed its use may be attributed to this error.

2. That one of the main benefits to be derived from its use is the opportunity which it affords for a change of diet and for furnishing a food more nearly approaching green grass than anything on the cattle diet list.

3. That one acre of corn ripened for the grain and one acre of ensilage will probably furnish a moré satisfactory ration than one composed exclusively of either one, and that even its mixture with dry fodder is an advantage though no meal be added.

4. That there is great danger in too thick planting, and that in order to produce the greatest precentage of food (without regard to total weight) the stalks should have sufficient room to develop small ears.

5. That on good soil and with ordinary manuring, rows three feet six inches apart, with stalks six to eight inches apart in the row, will give better results than thicker planting, and judging from some reliable experiments even thinner planting is advantageous.

6. That sweet corn, though it gives less bulk and weight than some of larger growth, will give a greater nutritive value per acre, and may be planted more thickly than is indicated above.

7. That, on account of the difficulty of gathering, and its liability to fall down, sowed corn is not desirable for ensilage, and that drilled rows which can be kept clean by horse power, will give the best results.

8. That there is a danger of injuring the product by cutting too early; the tassel should be well formed and ears partially developed before cutting, and in no case should the crop be cut while the pollen is dry on the tassel.

9. That it is best to cut and haul the corn when it is dry, as the moisture left after a heavy rain or dew is a disadvantage and any but the natural moisture of the stalk promotes a species of fermentation which should be avoided.

10. That short cut ensilage is the best because it will pack closer and thus exclude the air better; it will pack closer and will be less liable to mould around the edges of the silo.

11. That the silo should be constructed in small divisions not only for convenience in emptying but also so that the proper succession in filling may be observed.

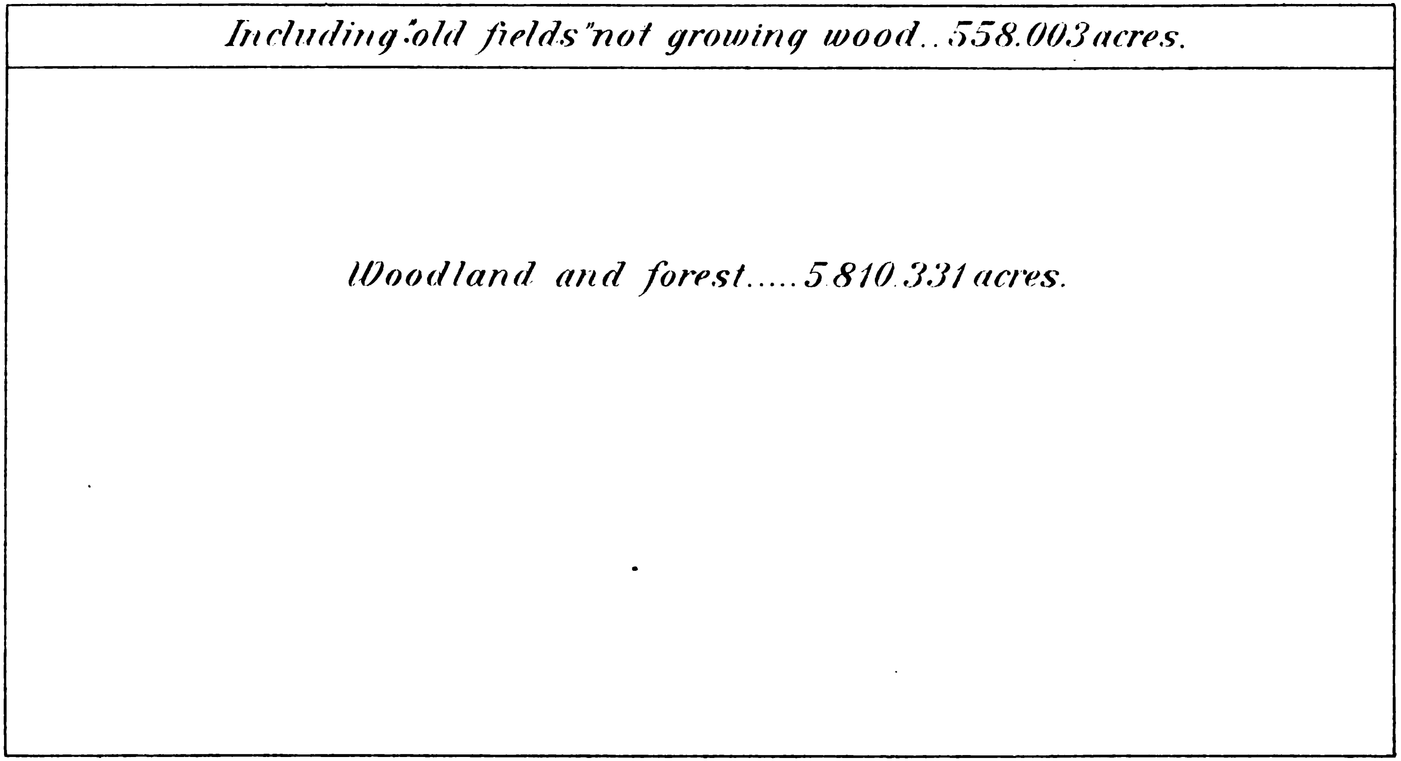
12. That it is important to thoroughly tramp the ensilage in the corners and along the edges of the silo; that at or near the middle, it will pack sufficiently without any tramping.

13. That one of the essential features of the silo is that it should be, as nearly as possible air tight, so that the element which promotes decomposition may be excluded and mould prevented.

14. That one corner of a mow in the barn, if built with double walls made as close as possible (with jointed boards) will preserve the ensilage as well or better than a close pit with expensive masonry.

15. That a silo constructed in this way, with proper subdivision, is much more convenent for emptying and may be constructed close to the stables in order to save handling.

16. That almost any palatable green material may be used in filling the silo and that if the crops can be grown at the proper time, second crop clover may be mixed with the corn to advantage.



DIVISION OF UNIMPROVED LAND IN FARMS IN PENNSYLVANIA.

Total area of unimproved land in farms... 6.368.334.

17. That those who claim that bitter weeds and other fall growth are as good as corn for this purpose, have an enthusiasm which exceeds that of the animals which consume the ensilage.

18. That in emptying the silo, care should be taken to expose as little as possible of its surface to the atmosphere because a species of decomposition or fermentation sets in which injures the product.

19. That a very good way is to cut the ensilage perpendicularly with a common hay knife, taking care to regulate the width cut off by the number of animals fed.

20. That pressure on top of the ensilage is an essential feature in complete success, and will, other things being equal, do much towards producing a first class product.

21. That this pressure may be produced in any economical way; screws, levers, weights or any other means of pressure may be made use of; any plan which will produce a regular and steady pressure will be best.

22. That in most cases loading the cover with stone will produce better results than a more expensive plan involving the use of screws, because the pressure secured by stone is constant and follows up the contents as they shrink in volume.

23. That it is an advantage to place some kind of refuse material on top of the ensilage before covering it up, so that the moisture may be absorbed and the usual covering of mouldy fodder avoided.

24. That practical opinions as to the comparative value of ensilage vary very much and that the ratio of the variation is such as makes the practical farmer doubtful and causes him to hesitate to incur the expenses required for this kind of provender.

25. That in most case where the "actual cost" of the ensilage has been stated, two errors have been made; usually an extraordinary crop has been taken for the data; and in most cases the interest on the cost of the land, for the time it is occupied by the crop, has not been taken into consideration.

26. That in this, as in other farm operations, the farmer who cannot afford to take much risk, had better progress slowly and try it on a small scale first, increasing the capacity of his silo if he finds it profitable; a silo in one corner of the barn can readily be extended if it is found advisable and profitable.

CONSTRUCTION OF THE SILO.

Through the courtesy of Silver & Deming, of Salem, Ohio, we are able to present to our readers the following illustration, description and specifications for a hundred-ton silo, in the construction of which all the influences likely to affect not only the storing but also the feeding out, were taken into consideration.

Fig. 1, which is drawn upon a scale of one eighth of an inch to the foot, shows the plan at the surface of the ground; *a a* represent two divisions or bins, each sixteen feet square and separated by a movable partition, *b*, made of two-inch plank; the corner posts are 4x4x16 feet, and the studding, *c*, are 2x10x16 feet; the door, *d*, is eight feet by two feet ten inches.

Fig. 1

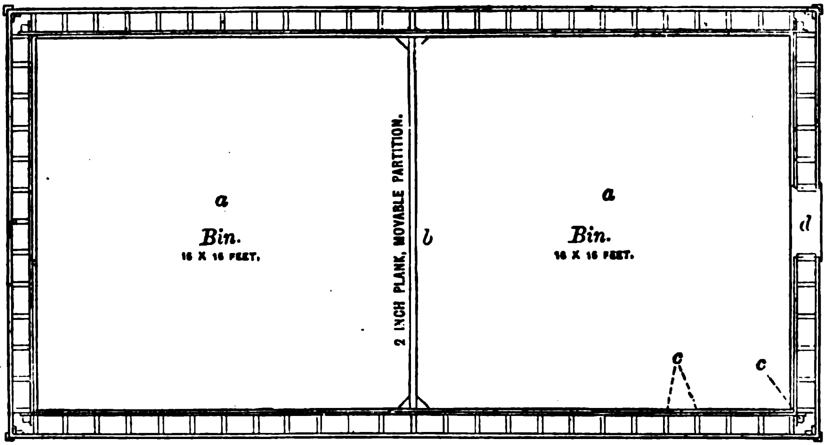


Fig. 2, presents a perspective view of the finished silo with portions removed in order to give a proper illustration of the interior construction, the door, *d*, is eight feet high and is two feet from the ground; *e*, is a dormer window with, *f*, a window through which the carrier for conveying the ensilage, may enter the building; *g*, shows the movable partition of two-inch plank; *h*, represents the tarred felting between the studding and outside weather boards and *i*, the similar felting between the two layers of siding inside the silo.

Fig. 2

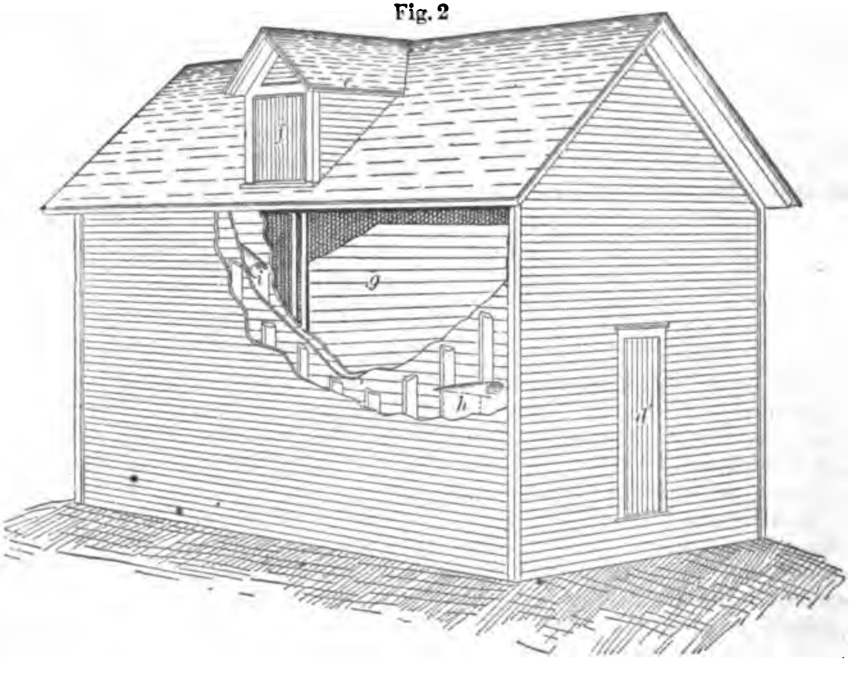


Fig. 3 shows the interior end elevation, in which *j* is the inside double siding with tarred felting between the layers; *k*, is the outside siding with felt against the studding; *l*, shows the roof braces and supports for alternate rafters; *m*, shows the plate on top of the studding; the rafters are two by eight inches and the after braces eight inches wide and one inch thick.

Fig. 3.

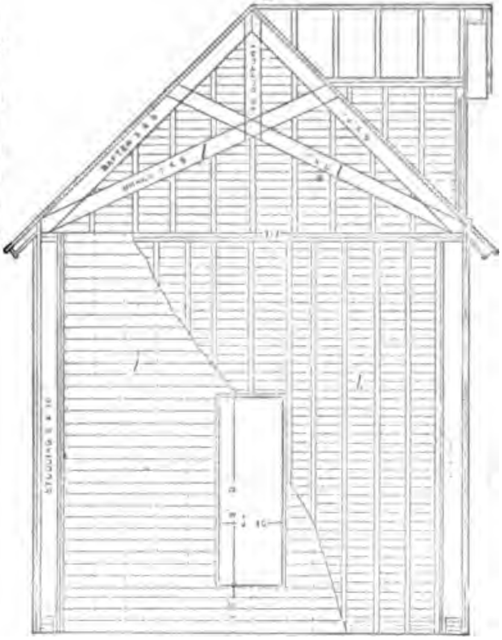


Fig. 4 shows, *n*, the studding, two inches by ten and sixteen feet long; *o*, represents a section of the sill; *p*, shows the foundation wall, which may be of stone or brick; *q*, two layers of siding with a layer of tarred felt between; *r*, the outside siding with felt paper against the studding; and *s*, the floor of the silo, which may be made of either earth or cement.

Fig. 4.

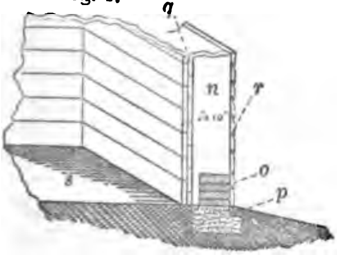


Fig. 5.

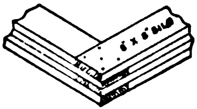


Fig. 5 shows a corner view of the sill made by spiking plank two by eight inches together.

Figs. 4 and 5 are drawn to a scale of one-quarter inch to the foot.

Silver & Deming furnish the following bill of the materials for the construction of a silo after the plan which we have illustrated:

4 scantling, 4x4x16 feet long, for corner posts.
96 studding, 2x10x16 feet long, for wall and plate.
26 studding, 2x4x16 feet long, for corners, gables, dormers, etc.
42 rafters, 2x8x15 feet long.
20 braces, 1x8x14 feet long.
10 supports, 1x8x6 feet long.
544 feet of 2 inch plank for movable partition.
2,400 feet of siding for outside lining.
3,340 feet of surfaced lumber for inside lining.
1,170 feet of surfaced lumber for roof sheathing.
400 feet of surfaced lumber for casing, cornice, door, etc.
11¼ squares of roof, 8,280 shingles lain 5 inches to the weather.
8,046 square feet of tarred paper for roof, interior and exterior walls.

Of the capacity of the silo, Messrs. Silver & Deming write as follows: "Each bin of the silo above has a capacity of about 4,000 cubic feet; allowing 25 per cent. for settling, each bin would contain 3,000 cubic feet, which would make a capacity of about 50 tons of settled ensilage, the weight of which would be about 35 pounds to the cubic foot.

therefore the above silo with two bins would contain about 100 tons of settled ensilage. The silo may be varied in construction according to conditions and circumstances. It may be cheapened somewhat by using only one layer of siding inside with tarred paper next to the studding. A three bin 150 ton silo may be constructed by lengthening to 48 feet, with another movable partition; a four bin 200 ton silo may be constructed by making it 32 feet square, with stationary partitions intersecting at the center, and giving four bins 16 feet square of 50 tons capacity each. The dormer window in this case may be nearer the center of the roof so that the ensilage will deliver easily into any one of the four bins by means of a carrier on the cutter and an adjustable shute. If built on level ground, this silo would require the cutter to have a carrier 36 feet long. If built against a hillside the length would vary according to the lay of the ground. The entire silo should be made air-tight; the door may be made so by being closed tight and fastened firmly against the tarred felting."

Charles R. Beach, of Whitewater, Wisconsin, thus describes the construction of his silo: "My silo is twenty-four feet long by twenty-two feet wide and eighteen feet high. It is built at the end of a bank barn, lapping eight feet against the barn; fourteen feet are against the bank. The bottom of the silo is on a level with the bottom of the basement of the barn, with which it is connected by a door through which the ensilage is wheeled to the feeding mangers. The silo is built of wood, upon a wall on the side two feet high, in which are set posts four to five feet apart, the tops of which are on a level with the top of the wall. On the bank side the wall is seven feet high. The sills of the building are of two-inch plank, one foot wide held in place by spiking them to the tops of the posts in the wall. The studding is of plank, one foot wide, placed thirty-two inches apart (the width of building paper). The plates are of plank, one foot wide, and mortised to the top of the studding. The building is kept from spreading at the top by false rafters, spiked to the plate and the regular rafters, reaching across to the opposite rafter, two feet below the peak and securely fastened. The building is covered on the outside with paper tacked to the studding, and then with lap siding. On the inside it is papered; then furrowed out with inch strips, then sealed with good matched sheathing. The roof is of the best shingles. A partition divides the silo into two compartments. The whole cost was $150."

Discussion following the Address of W. D. Hoard.

What length do you cut the green fodder? As a rule we cut it from a half inch to an inch; have not had enough experience to say which is best but prefer the shorter length because I think that it packs best in the pit.

When you are feeding it do you feed it to horses and sheep; it was stated here yesterday that it would kill horses and that sheep would not eat it? I have fed it to horses for about four years and my horses are living yet, and have fed it to sheep without any bad effects. In no case have I had any bad result to the animals eating it except when they get too much and then they are liable to injury just as they are from any other kind of feed.

Will it produce colic in horses? No sir; you have to exercise an intelligence about suddenly changing any kind of feed and especially from dry food to ensilage; it will not hurt a horse any more than sour apples.

Have you any farmers who are extensively engaged in raising horses, who have fed ensilage largely? Yes several; they do not use it as an exclusive feed, but feed five pounds per day in connection with ordinary food.

If you were cutting it for sheep, what length would you prefer? I should cut it a half inch, as I think that the finer you cut it the better for any kind of stock and the better it will keep; we have numbers of farmers who carry their stock hogs over on clover; I can take a hog and can support it on second crop clover, cut, dried and stacked nicely and with what they will eat of it, with one ear of corn each day, can keep them in first class order. I mean second crop clover cut and made into well-dried hay, not ensilage.

How do you cool the top layer of the silo? It cools itself; we put on this cold, green grass in a layer of say six to eight inches thick; as a rule the top six inches is not as good as that further down, but it is usually in good feeding condition. We can afford to lose a little on top.

You state that you put in about four feet of the green cut fodder and that it heats to about one hundred and twenty to one hundred and forty; is there any danger of it getting too hot? Then in three days time you put in another lot, is there any danger of it getting too hot? I have never known of any loss from overheating.

Is there any cover to the silo in the barn? None at all except the roof of the barn.

Can you explain why it is that after the ensilage has once heated, as you state, it will not heat again? Yes sir; for the same reason that milk that has once been well boiled will not ferment as it would otherwise do; the heat kills the germs which produce the fermentation and heat and the operation ceases entirely and is not renewed; this we control by filling the silo in layers and by allowing it time to heat before more is put in; if the ensilage is put in all at once, we cannot check fermentation in this way and it may go on to a point which will injure the product.

If you stir it up again and expose it to the air, will it heat the second time? Yes, certainly, but not so long as it is kept tightly packed and not exposed.

After you have opened the silo for use do you again close it? No, we leave it open until it is all used up, just as you would do with a stack of hay or fodder.

How long will your silo last? If made of pitch pine and the inside boards are given a covering all around, it will last a long time; there is of course more or less dampness and moisture, but after the ensilage is fed out the boards will all dry out while the pit is empty. Wooden silos are preferred with us; the mercury sometimes falls to forty degrees below zero and we find that wooden silos keep the ensilage from freezing much better than any other material; a stone wall three feet thick would not keep it from freezing. We put in no filling; there is no better non-conductor than an air space.

In giving us the cost of ensilage, do you take into consideration the labor and material? When I gave you the cost I reckoned the interest at seven per cent. on the cost of the silo, the cost of the machinery involved, the outlay for labor and the rental of the land at five dollars per acre.

How do you feed ensilage to cows to get the best results? You must remember that ensilage is a succulent carbonaceous food; if you are making butter you should give your cows a ration of at least one in five; that is, two and one-half pounds of albuminoids, two and one-half pounds of starch and two and one-half pounds of muscle-making material; now if you take bran and ensilage you change the character of the silage somewhat from what it would have been if dry, because it does not hold the same proportions of food as it would do in the dry state; my ration is about thirty to forty pounds—depending upon the cow—for often the cow which has the poorest digestion will eat the most; for a thousand pound cow I would feed about thirty to forty pounds of ensilage and about eight pounds of bran; if the cow is in her highest flow of milk or is below it, I graduate the feed to suit her condition, changing the amount of ensilage gradually. When she is giving her highest amount of milk she should have the most feed; then I would give her from six to eight pounds of bran in addition to the ensilage. I also give her about four pounds of corn meal and a pound of Royal Stock feed. This, with forty pounds of ensilage and five pounds of clover hay makes her feed; with warm water, this is my cow ration.

Discussion following the paper of John Stewart.

This is the ensilage just as it was being thrown from the pit when I started for this meeting.

What is the age of that sample? It was put into the silo on the 27th of September (the meeting was held December 27).

When was the silo opened? It was opened on the 20th of November.

Did you fill the silo continuously or did you fill it one day and let it heat for some time before more was put in? That is a point which I missed in my paper; some state that it should be filled slowly and the material allowed to heat about two days out of three; I do not think that this is correct; I think that the sooner the ensilage is in the pit the better it is for it, and the sooner the silo is sealed up after it is filled the better the ensilage will be. I admit that by this plan it will get very hot but it always comes out all right.

Have you any experience in filling one day and waiting for that to heat before putting more in? My experience in this plan has been confined to sight seeing only; I have visited the farm of Mr. Brooks, in Ohio, and also the farm of J. H. Durham, where the silo is in practical use all the time. Mr. Brooks has four silos and fills one each day, so that at the end of the fourth day he is back to the same silo again. Our ensilage is superior to any that I saw at either Mr. Durham's or Brooks', and they both fill slowly as I have stated. We filled our silo constantly from the time that we commenced until it was full; we commenced filling Friday and by Tuesday we had it full and packed down tight.

Was the silo weighted down when it was full, and if so how was it done? From the cover of the silo to a heavy beam at the top of the building there are four heavy iron screws, just like those of a cider press only longer; for the first pressure and while the top sinks readily we use a long lever; it is not at all material how the pressure is put on so that the cover is forced down tightly and so that the pressure is constant and regular all the time; it will not do to merely press the cover down and then leave it alone; the pressure must be kept up constantly and allow no room for the entrance of air, which will spoil the ensilage. A neighbor failed with his silo this year on account of not giving it proper and continuous pressure; after filling and putting the cover on he threw two cart loads of fence posts on it and did nothing more. There is at least a foot of spoiled ensilage all around the sides of the pit. Plenty of constant pressure is very important and without that you will fail in keeping the ensilage. I think that the greater the pressure the better it will keep.

After your experience with your silo, would you advise every farmer to build one? I certainly would, and if I was a farmer to-day and had thirty acres of land I would have a silo the very first thing.

How about ensilage for sheep? Sheep men do not need a silo; the sheep wont eat it, or at least our sheep wont; perhaps they are too high toned, but they will not eat it.

What size silo would you build for five or six cows, and with what kind of corn would you fill it? I do not know that it makes so much difference about the kind of corn; our corn has produced sixteen tons per acre; our common yellow corn makes good ensilage but it does not produce enough to the acre. In regard to the size of a silo for five or six cows—Mr. Kelso built his ten feet square and about twenty-four feet high, or just the height of his barn; his was for ten cows, and he thought that he had enough to keep them all winter, giving them a bushel basket each per day; our feed is three bushels to the cow.

How does he take it out of the silo? There are doors at one end, and it is taken out from the top first, taking care to keep it as nearly level as possible; the idea is to keep the air out as much as possible all the time; if the air gets in it will ferment and it is then not so good.

Would it not be an advantage to divide the silo into different compartments, so that one could be emptied at a time? Certainly it would, but it would also add to its cost and to the expense of filling it.

When it comes from the pit has it the same alcoholic odor that this sample has? Yes, sir.

How long will cattle fed with it and kept in the stables remain healthy? I have fed from the silo for two years and I am satisfied that no cattle in Washington county can compare with ours; we are often asked how we keep them so fat and sleek; they will hardly believe that the cows get but six quarts of bran night and morning. Two years ago I went to see a lot of cattle, sixty of as fine Holsteins as you ever saw, they were as smooth and sleek as if on summer pasture, and yet they had not been out of the stalls from the twenty-seventh of November, and it was the fifth of May when I saw them.

How high did the ensilage heat before you put in the batch of the second day? I cannot tell that; we left it three days after was filled to get up to the proper heat.

W. D. HOARD. The first silo built in the West was built in Wisconsin, in my own time, by myself and Mr. ———, in 1886. We took it from a French drawing, and it was greeted with a howl of derision from one State to the other; we didn't push it very much, and by and by it got a foothold and then came this form of making ensilage, the sour ensilage; it is superior to any form that I know of. Now you have a pit of three compartments and fill one day, and fill say four to six feet with your corn; the air is the essential element that starts the secretions of all the carbon in the plant; fill to-day four to six feet and to morrow four to six feet; you have brought up the heat of the first filling to 120; it is thus kept so it don't pass over the ascetic state; when you want to keep milk from souring put it on the stove and heat it; that is just the trick we do in ensilage; it is carried up to this stage of heat, enough to carry the heat of this batch of ensilage to 120 or to 140; then put in a cool batch on top; it cools it down and it never passes beyond it; the ensilage came out last winter—we have them all around us—came out of them just as sweet, you couldn't discover the least taste, and to day one hundred and twenty pounds of it is a day's feeding for our cows; now, cows will eat a great deal more sour than sweet; they will eat more if the plant is matured; we find it is better to cut the corn and let it stand about twenty-four hours, then we take out thirty per cent. of the water, put it into the silo, in the three pits, so you can bring up the heat in this way and pass right around from one to the other, and in that way bring up the ensilage, and as a ration I never saw anything like it in my life.

WHAT FOREST LEGISLATION IS PRACTICABLE IN PENNSYLVANIA.

By B. E. FERNOW, *Chief of the Forestry Division, Department of Agriculture, Washington, D. C.*

(An address at the annual meeting.)

The forest legislation which is needed in Pennsylvania as well as in most other States, must be directed, first, to a better protection of the forest property which we have from nature's kind hands, as long as it may last; secondly, to a protection of the future crop, as far as nature has kindly restored it or man has planted it; thirdly, it is to provide and make accessible such information as will enable the people to utilize their forest growth to better advantage, will enable them to see the necessity for reforestration in certain places and the desirability in others, and furnish the basis of a rational system of forest management, just such as we attempt to introduce into agriculture; fourthly, legislation may go so far as to recognize a temporary need of directly encouraging private activity in planting and caring for forest property by means of temporary financial assistance, or other aids, reduction of taxes, etc.

Fire laws.—The first call for legislation is one that nobody can find improper.

Everybody, every sensible man, admits the necessity, or at least the desirability of protecting forest property, like all other property, from fire.

Prevention of fire is of course better than fighting fires, and any regulations that will reduce the chance of danger from fire should be first considered. These can generally be only indirect. But one direct and legitimate manner of preventing fires from one cause, is in our hands; we can enforce the use of spark arresters in locomotives by railroad companies, such appliances are used with entire satisfaction on most locomotives of the Pennsylvania Railroad Company and elsewhere. An additional order, to keep rights of way free from inflammable material, which is easily accomplished, and fixing the liability of damage on the part of the companies, disposes of one class of fires, and not a small one, easily.

A rule providing that all firing for purposes of clearing be done at seasons when the least danger from spreading exists, and only after due notification to the neighbors and proper authority, will lessen another cause of fires.

Fires arising from negligence, wilfulness or malice, can only be obviated by making people less negligent, and by punishing the wilful. But this cannot be done simply by enacting a law providing all sorts of things and threatening all sorts of punishment. Providing the machinery for the enforcement of the law is of more importance than the enactment of the law; in fact, the forbidding by law, which is so easy, will never meet the case; it is the *organization* of communal and private interests for carrying out the law which we must look after. If the community is made aware that it costs them something to have a fire put out, if everybody can be forced to help extinguish the fire or be fined, and is held strictly accountable for acts by which injury comes to another, everybody will be more careful for himself and will also help to guard against others. When, in addition, a designated fire warden is charged with this interest of the community, and a higher authority with looking after the due enforcement of the law, we may hope that the laws will not remain nugatory, as they have largely hitherto.

The Pennsylvania fire laws of 1869, 1870 and 1879 contain much that would recommend them, but they require to be amplified, consolidated and made applicable to all parts of the State. My own experience in the application of the law of 1870, for the last eight years, has been entirely satisfactory. An expense to the county of less than ten dollars during this period was the only cost occasioned by the only fire which the fire warden was called upon to extinguish, while before the appointment of the fire warden fires were of yearly occurrence. Legislation in this direction is so important that it should form a full and comprehensive chapter of its own and not be mixed with anything else of forestry legislation. It is simply the moral obligation of the State to do its duty in protecting my property efficiently which I call upon—forestry or no forestry.

Stock laws.—Next to the fires, cattle must be ranked as most injurious to the future of forest growth. I have had more annoyance from stock running at large than from fires, and I am almost tempted to say that in some localities the tooth of the cattle does more harm to the promising young growth of the future than the fire. I do not admire fences, they are a waste anywhere, and show a lack of appreciation of personal and property rights, a lack of discretion or knowledge how to behave. I admire still less the idea that I must bear the expense for my neighbor's neglect, when he allows his cattle to devastate my property. After my coppice has grown out of reach of the cattle, say in four or five years, I would not object to allow my neighbor's cattle to roam through it, and where few cattle range over large tracts, the damage is perhaps not appreciable at any time.

The interests of different parts of the State in this particular differ greatly. A uniform stock law, optional to counties or even townships seems called for. Here too, the machinery to put the law in operation and to insure ready redress of grievances, is of principal importance. Whether the enforcement of such laws could not be made a duty of the fire wardens may well be considered, as the cattle are often doubtless the indirect reason for firing woods.

In the legislation which deals with the forests as property, I will not claim, as I might for good reasons, that it should be considered as a property requiring special care by the legislator and judiciary, but let us at least have it considered as good a property as any other and deserving as much consideration by legislators, by judges, and by our *neighbors.*

Such laws of protection as I have cited can be set in operation in the State without involving any new ideas of State interference. As regards laws which restrict the use of the forests by their owners in any way, I do not believe we can educate our communities to see the necessity in time to effect anything like forest preservation. The wasteful practices of the lumberman, and of the tie cutter or bark-peeler, have brought the natural supplies of the State, in less time than was necessary, to a condition when the white pine is nearly exhausted and the hemlock following fast; when the hard woods are mostly reported second growth and of poor quality, so that the Lehigh Valley railroad must send to Virginia for ties; and manufacturers report from forty to fifty per cent. of their white oak supplies from other States. This is a sad state of affairs, but admits of no immediate remedy.

Nor do we regret so much the unfortunately wasteful removal of the old growth, which grew to be utilized, as we do the absolute disregard to the renewal of valuable growth.

There are barrens and waste brush lands on many hills and mountain sides, which, unfit for any other use, should be growing a valuable wood crop for the future.

I cannot enter here upon a discussion of some mooted points as regards forest influences. Whatever may be the truth as to their influence upon the climate and especially upon rainfall, I leave to those to find out who are ever ready to fight in the clouds, on theories, without a proper basis. Those who deny the influence of the forest cover on the water waterflow in springs, brooks, rivers, and on soil conditions and agricultural conditions in general, I must here briefly dismiss, with the advice to pray for light, insight and knowledge.

Ignorance has had a large share in the useless haste with which the rich gifts of nature have been wastefully disposed of, and ignorance also clouds the future of our forestry interests.

The next step then, after perfection is afforded, that I would propose, is to provide that knowledge upon which proper legislation can alone be framed. If "ignorant legislation is criminal legislation," it behooves legislators to acquire the needed knowledge of the conditions of the object of their legislative action. An annual or biennial canvass, made with the aid of tax assessors, of the forest areas and their conditions, as also of the lumber business and the various wood-working establishments, with a view of keeping an approximate idea of supply and demand before the public, seems highly desirable. Other statistics, which will aid in a proper appreciation and consequent rational legislation with regard to forestry interests, will suggest themselves.

For the gathering and digesting of such statistics, I would propose the appointment of an energetic Forest Commissioner, well fitted for the position, well paid and suitably provided, charged also with the forestry interests of the State in all their bearings, who should interest himself in seeing fire and forestry laws executed, who should furnish such information as is needed by forest planters, legislators, manufacturers, etc. You might delegate such duties to an unpaid commission: that is cheap and correspondingly useless; you might impose these duties upon your Board of Agriculture, and with such an efficient secretary and excellent personnel of the Board as you have, I have no doubt they would do their best. But the best horse put to an overload, will pull himself to death or become a balker.

That the gathering of such statistics as I have advocated and the other duties outlined, must be entrusted to a man specially fitted and specially charged with such work, is evident, if you wish to accomplish anything of note. If you want to legislate for forestry don't begin with half measures and instead of launching out in half a dozen directions, have one thing done well. An efficient Forest Commissioner, well provided with the necessary funds to do his work—good work costs—will repay soon the expenditure to the State, by an awakened interest in forestry matters on the part of the community, by an appreciation of the importance and the position of forestry towards all other industries, by affording a proper basis for intelligent legislation, and by dispelling the ignorance, which keeps our people from giving more attention to this great interest. If you have more money to spare for this interest, there are many ways in which it can be properly and effectively applied.

Among other methods by which State legislation can dispel ignorance, I would suggest the endowment with funds of your State Forestry Association, which with so much zeal and energy has engaged to do their missionary work. The collection and distribution of information might be partly accomplished by the aid of this association, if the State would enable it to do so, and I am sure such encouragement of associated effort would soon be appreciated in every county.

A wandering lecturer, supplied by such an association, without the interference of political preferment, and acting in harmony with the Forest Commissioner, who should arouse to intelligent action and instruct the people in forest management and forest culture, might soon produce as good results in the care of young forests and the enforcement of the laws as such institution has brought about in Switzerland.

I do not consider that we are in need, as yet, of full forestry schools, but the Agricultural College, to be worthy of its name, should be enabled to give a course in forestry as one of the branches of soil culture.

The State Agricultural Experiment Station should be enabled to make such laboratory and field experiments as are needed to show the true value of timbers, to show the dependence of their quality on the particular factors of site, to ascertain their rate of growth, and other laws upon which a forest management must be based.

There still remains to be considered the legislation of direct encouragement to tree planting. This, in my opinion, is the last to be attempted, the most difficult to devise and execute, the most harmful to the morals of a community if not properly framed and guarded. If there is not proper authority provided to watch over the compliance with conditions upon which the community extends its helping hand, I should say, don't touch it. Yet with a Forest Commissioner to look out for the interests of the people, such direct encouragement is not impossible. But your aid must be adequate and be really an encouragement.

The provision of our recent law, which will allow me a release of taxes for three decades of 45, 40 and 25 cents per acre at the highest, does not even encourage me to undergo the trouble of asking for it, although I have some 4,000 acres which I could bring under the provisions of that law. A distribution of plant material, free or at nominal charges, in sufficient quantities to those who wish to plant their waste places to trees, it seems to me, would be more encouragement, less trouble, and answer a better purpose.

To give you an idea of what I mean by sufficient quantities, I will state, that poverty-stricken Prussia—with an excellent forest administration and a people fully alive to the importance of forestry, distributed last year, free of charge, over 38,000,000 seedlings and 24,000 pounds of seed, at nominal prices. The United States Government encourages forest planting by the distribution of seeds and seedlings to the value of about $500 a year.

In same localities the forest cover is of such importance that its removal or even deterioration, brings, in time, hardships upon large districts which depend for the regularity of their water supply upon such forests. Here enters a new aspect of legislation, for which there seems to be no precedent, unless we can find one in the control of waters and roads, in which the higher rights of the community allow interference with private rights. Such localities, however, are not very frequent except in mountain districts.

Mountain forests such as these, must either be owned by the State, community, or county, or else their interference in the manner of utilizing the same is called for.

It may be wise for the State to own such tracts and maintain the same as forest reserves. At least a State law which will encourage the holding of forest areas by townships or counties, and their administration under direction of the Forest Commissioner, is highly desirable. There is no reason why a township or county should own and manage a forest, when it is in the interest of the community to so own forest property, just as they own and build roads, bridges, and school houses, or as a city owns its municipal buildings and other property. The community is not only richer than the private man, but is longer lived and can more conveniently wait for returns. Let then, where public interest should demand afforestation, the community step in and plant the forest on the land of the private owner, charging the outlay in the form of a lien or mortgage upon the growing forest, with all the rights and liabilities that usually pertain to such investments, except that the interest may accumulate until the crop is ripe and ready to be marketed, when the loan with accumulated interest must first be repaid, before the owner reaps any benefit. Any such forest planting, now begun, will at the time when the crop becomes useful, prove such a satisfactory investment that no further encouragement for careful forest management will be required by the harvester.

I could go on suggesting possibilities without end, for proper and feasible legislation, but must end somewhere. I therefore summarize with the simple statement of legislative action in the interest of forestry, which is practicable and needed for Pennsylvania without delay, in the sequence in which I state them.

1. Consolidate, extend and amplify the existing fire laws of 1869, 1870 and 1879, and perfect the organization which is indicated in the law of 1870, for the execution of the law, and include the suggested rules in regard to railroad companies.
2. Draft a universal stock law, optional to counties or townships.
3. Appoint a Forest Commissioner, with adequate appropriation,

to look after the execution of the protective laws, to gather statistics, and for other duties, as outlined.

4. Endow the State Forestry Association with such sum as will aid their work effectively.

5. Enable the Agricultural College and experiment Station to do, what they ought to do and can do for forestry.

6. Appropriate funds and devise a good plan for distributing plant material to those who would engage in forest planting. With such legislation, carefully prepared, I am willing to place Pennsylvania first among the States, as far as intelligent forest legislation goes; and I have no doubt, that within a year after the operation of such enactments, all further legislative action that is possible, will suggest itself, and a bright future for Pennsylvania's great forestry interests will be assured.

HAS THE DESTRUCTION OF THE PENNSYLVANIA FORESTS REACHED THE DANGER LINE?

By N. F. UNDERWOOOD, *Member from Wayne, Lake Como, Pa.*

(Read at the annual meeting.)

The interest of the agriculturist in the forestry question is of a twofold character. First, as to the effect which a lack of arborescent growth may have upon climate, upon the growth of farm crops, the water supply of farms, etc.; and, secondly, as to the supply and price of lumber and timber, so largely used in erecting and keeping up suitable farm buildings. How far the destruction of forests effects climate is a question which must be referred to men of science, whose opportunities enable them to observe the effects in many localities, rather than to the local observer engaged mainly in practical affairs. That the clearing away of woodlands does result in drying up springs and rivulets, diminishing the flow in streams, increasing the liability to destructive floods, and giving free scope to piercing winds, are facts confirmed by the experience and observation of many. The moderating effect of trees and shrubbery, planted about farm buildings in the form of wind screens upon the rigors of our northern winters, have also often been noticed and referred to, yet how few have as yet availed themselves of this comparatively inexpensive protection from the winter blasts. I must be content, however, to leave this part of the subject and confine myself to the more practical part, relating to timber supply. The statistics bearing upon this part of the subject are not as full as I hoped to be able to get, yet I trust they may throw some light upon the question of how much timber yet remains in our State, its distribution, and the length of time it is likely to hold out and supply our wants. I may say in the outset that the principal kinds of building timber found in Pennsylvania are pine and hemlock. So far as I am informed the great body of the pine timber is confined to the regions watered by the west branch of the Susquehanna and the Allegheny and their tributaries. The hemlock is almost entirely in the northern part of the State, with many northern counties now practically destitute. Beech. birch and maple also occupy the northern half, where extensive forests of these kinds yet remain, with linden, ash and cherry, which also follow the mountain region farther south, while the oaks and chestnut find their congenial home in the central and southern portion, and furnish much valuable timber for fencing and building. Besides the regular traffic in lumber for building and fencing purposes, there is a constantly increasing demand for timber of nearly all kinds, to be worked up into various manufactured products. To supply the acid factories nearly all kinds of what are called hard woods are indiscriminately used. The products of these factories are pyroligneous, or wood acid, in the form of acetate of lime, wood alcohol, now largely used for various purposes in place of grain alcohol and charcoal. A few years ago a single factory supplied the entire demand, but at the present time a large number of factories are in operation, requiring hundreds of men to cut the wood from many hundreds of acres every year. Excelsior factories are also being established in many places, each one consuming a thousand cords of basswood and poplar wood annually. Manufacturers of umbrella and parasol sticks and printing rollers are after the maples. Slate makers use up large quantities of beech and cherry. Chair makers, clothes-pin makers and barrel makers want birch, beech and maple. Furniture manufacturers make drafts upon nearly the whole lists of Pennsylvania woods. The thrifty and tough second growth ash is eagerly sought by manufacturers of scythe-snaths, cradle-snaths and fingers, rakes and handles for shovels, forks, hoes, etc.

The three great lumber markets of the State are Philadelphia, Pittsburgh and Williamsport. The latter, though mentioned last, undoubtedly handles and distributes more Pennsylvania lumber than both the other two. Philadelphia absorbs and consumes large quantities of lumber, but distributes little grown in the State. The lumber from the Allegheny river region is divided between Pittsburgh and more distant markets down the Ohio, but of the traffic in that section of the State, I cannot speak advisedly. Some statistics of the Williamsport lumber trade will be given further on, but first as to rafting lumber on the Delaware river. The first raft of timber ever run down this river was run in 1764, by Daniel Skinner, of what is now Damascus township, Wayne county, and consisted of a few pine spars, cut near the river bank. As the settlements along the upper Delaware increased, rafting lumber down the river became one of the principal industries in Wayne county, and in the counties of Delaware and Sullivan, in the State of New York. As early as the beginning of the present century, the business had reached considerable proportions. I have no data to determine the time of greatest production, but it was probably between 1850 and 1870. Up to the latter date, no record of the quantity run has been kept, but in that year the Delaware and Hudson Canal Company stationed Judge Thomas J. Ridgway at Lackawaxen, where their canal crosses the Delaware, with instructions to keep a record of all rafts run, which he has done, and through his courtesy I am able to present the following statistics. The number of rafts run in 1870 was, in round numbers, 2,900. In 1871, 3,200, which is the highest number run in any year of which a record has been kept. It then commenced to decline, dropping next to 2,600, then to 2,300, 2,000, 1,800, 1,700, 1,500, 1,100, 900, 800, 700, until in 1887 the total number of rafts of all kinds was 678. Of the kinds of timber contained in these rafts, Judge Ridgway says, "about three-fourths of the timber was hemlock, and one-fourth pine, maple and bass." The hemlock rafts would probably average 40,000 feet, which would represent about 96,000,000 feet of hemlock rafted down in 1871, and about 20,000,000 feet in 1887, a falling off of nearly four-fifths in sixteen years. I think the actual hemlock lumber and logs run in 1887 was less than the amount above stated, by several million feet, as many of the rafts counted as hemlock and included in the estimate, were small round timber, called toggle-timber, used in wharf building. Practically, the rafting business on the Delaware is a thing of the past. Wayne county has still a few scattered hemlocks left, but very little to export. Lumber at the mills there to-day sells for $10 per thousand feet, which is the outside price at which it can be sold out of the raft in the Philadelphia market, and then, between counters and buyers, the seller stands a chance of getting done out of 10 per cent. of the amount of lumber he puts into the raft. We no longer have to allow the buyer to name the price and make out the bill to suit himself. For a few more years, a few rafts will be brought down, but soon the last steeersman will have made his last trip on the Delaware. Of the counties in New York which have formerly contributed to the supply rafted down the river, Sullivan is now even more destitute than Wayne, and a large part of what is now cut in Delaware county, is either used at home, or shipped by rail to eastern markets.

From the report of the board of trade of the city of Williamsport, published in 1886, I condense the following in relation to the lumber trade of Williamsport and the West Branch Valley: "In 1846 a charter for the Susquehanna Boom Company was obtained from the Legislature, and it was organized in 1849. The original stock consisted of 100 shares of $100 each; at present the capital stock is $969,600. Up to the present time the expense of building and maintaining the boom has exceeded $1,300,000. The following official record kept since 1852 will show the extent of the business of the boom:

Years.	*No. feet.*	*Years.*	*No. feet.*	*Years.*	*No. feet.*
1862,	37,853,621	1870,	225,180,978	1878,	112,069,602
1863,	76,475,826	1871,	166,661,181	1879,	190,549,111
1864,	96,595,681	1872,	297,185,652	1880,	133,078,017
1865,	72,421,468	1873,	318,342,712	1881,	289,826,780
1866,	118,831,495	1874,	180,734,382	1882,	220,136,306
1867,	163,196,511	1875,	210,746,956	1883,	203,769,838
1868,	165,338,389	1876,	134,396,293	1884,	240,382,208
1869,	223,060,305	1877,	106,944,257	1885,	225,347,555
Making a total for 24 years of					4,309,125,118

and an annual average of 179,546,879 feet." The same authority estimates that at least 150,000,000 feet more might be added for lumber brought from Lock Haven by canal during said period, which did not pass through the boom. "There are 28 saw-mills, great and small, embraced in the Williamsport lumber district. The majority of these mills are first-class in every respect, and one of them, at least, ranks with the largest in the world, having a cutting capacity of 35,000,000 of feet annually. From this brief outline of the lumber business its magnitude is clearly seen, and it is not likely to decline in value, and in the number of feet manufactured during the present century. There are still great forests of pine timber in the mountains that will yield hundreds of millions of feet, and the primitive hemlock wilderness of Sullivan county, less than 75 miles from Williamsport, has scarcely been broken." From the tables given of lumber sent to market from this point from 1869 to 1885, a period of 17 years, it is stated that the total amount was 3,672,816,495 feet; an annual average of 216,048,290 feet. "This lumber is from the Williamsport market, and represents the product of the mills in and around the city only. The quantity manufactured in the West Branch Valley, when added to our total, increases it more than a hundred millions. This shows an average of 279,041,897 feet shipped each year for the whole period. These figures include the amount manufactured at Lock Haven as well as the receipts from Larry's, Lycoming, Loyalsock and Muncy Creek regions. They are sufficient to show the magnitude of the lumber product of the West Branch Valley and the vast source of wealth it has been to the people." As to the kinds of lumber here represented the tables of shipments make no mention, but from a table of stocks of lumber on hand at the close of each year from 1870 to 1886, the average was of pine 134,092,021 feet, and of hemlock 23.569,011 feet, or a little less than five and a half feet of pine to one of hemlock. During the period, however, while the stocks of pine were about the same at the close as at the beginning, the stock of hemlock had increased ten-fold. From information obtained from various sources in relation to the timber supply of the State, I present the following: Mr. James McCracken, Jr., member of the State Board of Agriculture from Jefferson county, a practical lumberman, says, "Pine and hemlock are worth 10 per cent. more, both here and in Pittsburgh, than 10 years ago. Oak is worth 50 per cent. more, as we now have a railroad to let us out to eastern markets. There has been an advance of perhaps 20 per cent. in timber lands during the past ten years. At the present rate of cutting, the timber supply in Western Pennsylvania will not last more than twenty years. There is a great deal of stump land upon which young timber is growing, but it grows so slowly that I think there is as much cut in one year as will grow in twenty five years.

Mr. S. S. Van Etten, of Hoytville, Tioga county, superintendent of Hoyt Brothers' extensive tannery business at that place, says: "From the best information I can get there is now about 1,500,000 to 1,800,000 cords of hemlock bark growing in this county. There is used annually by the eleven tanneries now in operation about 90,000 cords, and there are about 10,000 cords shipped out of the county each year. Taking these figures, about fifteen to eighteen years will exhaust the supply of hemlock bark. For the last five years the number of tanneries has increased as well as an increase of bark consumed. This estimate is based on last year's business." Mr. Nathan Skinner, now of Williamsport, but formerly a Delaware lumberman, and well informed in lumber matters, estimates that 46,000 cords of hemlock bark are annually peeled in Lycoming county, all but 5,000 cords of which are used in tanneries in the county. He also says: "I think this year's stock of logs will reach 250,000,000 feet, which will probably be the largest, and from this the cut will rapidly decline, unless there is more hemlock got in." This does not exactly agree with the board of trade gentlemen, but we must remember that Williamsport always has a boom in the lumber business, and that her people spell "boom" with a big B. Mr. Peter Reeder, member of the State Board from Lycoming county, but having quite extensive lumber interests in Sullivan county, estimates that the supply of hemlock in the latter county may last for twenty-five years.* Of the quantity of pine timber each year cut in the State, or the amount now standing, I have no means of judging except from the figures given above. From estimates based partly upon the list of tanneries in Pennsylvania, published in the Shoe and Leather Reporter Annual for 1887, and partly from other information, I think the quantity of hemlock bark peeled in the State each year cannot be less than 500,000 cords, and is probably much more. Allowing six cords to the acre, which is a high estimate, and we have 83,333 acres cut over every year. Allowing that each cord of bark represents 1,000 feet of lumber, which is a low estimate, and we have 500,000,000 feet of hemlock lumber cut in the State every year. To understand the full force of these figures one must have some personal knowledge of forest areas, and some experience in woodcraft. The answer to the question, has destruction reached the danger line? will depend upon the answer given to several other questions. How large a timber area still remains in Pennsylvania? What proportion of what remains is being cut each year? At the rate it is being cut, how many years will the supply last? Is the rate of cutting likely to increase or decrease? how much of the land from which timber is cut is again allowed to grow young timber, and how long will it require to grow a second crop of usable or merchantable timber? Some of these questions have been asked by the Forestry Committee of the State Board of Agriculture, and the answers given may be found in the reports of the proceedings of the Board. The question, how large a forest area still remains? is a difficult one to answer, as no reliable table of woodland areas in the several counties is at present to be found, so far as I am aware. The director of the United States Geological Survey is now endeavoring to get an estimate in all the States, by counties, of the area of timber lands, and of the quantity of timber of all kinds still remaining. While this compilation will be only approximate, it will probably be much better than anything we have at present as a basis of calculation of timber supply. From what can be gathered, it would seem that the situation may be summed up about as follows: There is no immediate danger of a short timber supply, or of unreasonable high prices. The present, or an icnreased rate of cutting will continue as long as there is room to maintain it. The time is coming in from twenty to twenty-five years when the harvest of Pennsylvania timber will be over, and not until nature's inflexible law, which requies a season of sowing and planting, a time of nurture and tending and waiting has been fulfilled to the letter, can there be such a thing as a second crop. A few kinds of timber, as the chestnut and linden, may renew themselves by sprouting, and at the end of a generation the same land may furnish a new supply of timber of respectable size, but in the case of the hemlocks, the present growth of which is so surely doomed to destruction, there is no such thing as a second crop. What a generation would do for the quick-growing and rapidly-renewing kinds, would require a century of waiting in the case of the hemlocks. While it is undoubtedly true that in twenty or twenty-five years the supply from our Pennsylvania forests will be practically exhausted, it does not necessarily follow that the next generation will experience a timber famine. At the present time, the timber of the Eastern, Southern and Western states is crowding into Pennsylvania markets and competing with the products of our own woodlands. Look over the stocks of lumber stored in the covered lumber yards of Philadelphia, and you will find in addition to all that our own forests can furnish, spruce from British America and the State of Maine, yellow and other pine in abundance from the Carolinas, cedar and cypress from various Southern States, black walnut in quantity from the south and west, oak and poplar from West Virginia, hickory from Ohio, and even the famous Sequoias or redwoods from California. The forests of the United States are still vast in extent, and for many years to come the woods will be full of timber, even when the song of the buzz-saw has ceased to be as jubilant in our State as it is at present, and the fires have gone out in the furnaces of Pennsylvania tanneries.

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*Potter county at the present time undoubtedly contains more hemlock than any other county in the State, and nowhere is it being cut more rapidly. Tanneries are numerous, and one lumber operator, M. J. D. Goodyear, of Buffalo, peeled this year 65,000 cords of bark, all of which is shipped out of the county. The lumber shipped out of this county ever' year must run up into the hundreds of millions of feet. Good judges estimate that twenty years or less will use up the hemlock in that county.

We speak of the destruction of forests in our State, and the popular idea seems to be that such destruction is largely wasteful and wanton. There are at least two sides to be considered in judging of that question. The redman's mode of living made him naturally a conservator of the trees. He would not, if he could, have destroyed them, for they afforded protection to the game upon which he subsisted. He could not if he would, for his implements were unsuited to the purpose. He might as well have attacked the hills and sought to level them down as to have attacked the woods and tried to clear them away. The white man's necessities made the trees to him an enemy, only a little less formidable than the redman he had dispossessed. The pioneer must have land to till, and before he could till it he must cut down and clear off the timber. He must battle resolutely, year after year, with the giants of the forest, laying them low with trusty axe in winter and subduing them by fire in the heats of summer. Gaining his victories slowly, through unremitting toil and patient endeavor, no wonder that he grew indifferent to the fate of the trees. Not until many pioneers had each cleared many acres and many noble tree trunks had been sacrificed did those that remained have any marketable value. At length towns and cities began to spring up, and a demand was created for what had before been only an obstruction to his progress. His resources were still slender, and with as little compunction as he had formerly cut down the trees and burned them, he now cut down all which had a value and sold them. As the cleared area grew larger and the timber area smaller, lands which formerly had no value until they were cleared began to have some value for the timber growing on them. Investments were made in such lands in the expectation of a rise in value and consequent profit. Originally sold in large bodies, thousands of acres in extent, at a very low price, they in the course of years were subdivided and resold to settlers or smaller operators, usually to men of limited means, who, making a small cash payment, ran in debt for the balance, taking the chances of making this payment off the land by sale of the timber. In a majority of cases it was a matter of business necessity, of financial self-protection, that impelled the owner of timber lands to cut down and utilize his trees. He had put all his ready money, and often all his credit, into his timber tract. It is for the time being his bank, and, while he may consider it a safe institution, it is at the same time an inconvenient one. He cannot draw upon it at sight and have his drafts promptly honored. He must begin to-day to set in motion the machinery which shall give him cash in place of trees and logs in from six to twelve months. To bring about this exchange he must employ all the paraphernalia of the logging camp and the log drive, all the mechanism of the lumber mill. His obligations must be met, his interest paid. He must crowd into the market along with the rest and sell his timber for the best price he can get; but he must sell it for some price. He cannot gain by holding it over; neither can he hope to profit by letting the timber stand uncut for five, ten or twenty years, for his obligations grow faster than his trees. I have never seen the time when it would be a profitable investment to buy and hold timber lands for a rise. There has seldom been a time when it would not pay to buy timber land and "skin it," as the lumberman terms it. Many large operators have taken advantage of this fact, have bought large tracts of timber land, opened up roads into the wilderness, built saw mills, and are vying with each other in skinning the timber off the land as fast as possible. Thus we see that the mighty forces of necessity and self interest conspire against the life of the trees. While this is true in regard to all kinds of timber, it is particularly true of the hemlocks. A very large portion of the hemlock lands of the State are owned or controlled by tannery firms. They have invested large sums of money in these lands and other large sums in building and equipping tanneries. They cannot allow these works to stand idle. Once started, they must continue to run, and it is the unvarying rule among tanners that whether prices of leather are high or low, whether the business is profitable or unprofitable, they must tan on as long as the supply of bark holds out, and this will continue until the end comes.

And what is the remedy? There is no remedy that will save the original forests that remain. As the others have fallen, they will in turn fall. Shall we then depend on procuring our needed supply of timber from other and more distant forests? Shall we devise ways and means for dispensing with timber, and make stone and steel serve us in place of wood? Shall necessity compel those who come after us to cultivate trees, as it compelled our ancestors to kill them? Shall profit hereafter be found in growing them as it is now found in destroying them? These questions are too large to be considered in this connection, and are entitled to full and separate consideration by themselves. The time is coming, is now near at hand, when no question will be of more vital importance to the Pennsylvania land owner than that of how best to restore the wasted woodlands of the State. In solving this problem, there is abundant room for both thought and work. It will not be wise to leave the work of restoration wholly in the hands of nature, for while nature can do, is doing, much to reclothe the waste places in our forests, nature does not always in selecting species, give us those most useful to us, nor can she unaided successfully cope with tramps and incendiaries, private and corporate, whose carelessness or malice often, in a few hours, destroys the work of years. How can nature's generous efforts in our behalf be best assisted? The State can do something. The act of June 1, 1887, is good as far as it goes, but it does not afford adequate protection against irresponsible depredators. Forestry associations can do something, but much must be left to individual work. We have learned only too well how to get rid of trees, we need now to learn how to replace them. We shall find the last problem a harder one to solve than the other.

THE MOUNTAIN REGION OF CENTRAL PENNSYLVANIA, AND ITS RELATION TO FORESTRY.

By Prof. W. A. BUCKHOUT, *Entomologist of the Board.*

[Read at the annual meeting.]

Central Pennsylvania physiographically should comprise all that part of the State between the curving east front of the Allegheny range proper on the west, and the Blue Ridge on the east. These two boundary lines run nearly parallel to one another, but curve so much to the east in the north Susquehanna region that they include a considerable part of what is geographically the eastern part of the State. This large curving band is fairly distinct from the plateau region on the west and the Great Valley and South Mountain region on the east. For my present purpose, however, I prefer to consider only that part of it which lies between the Allegheny ridge and the Susquehanna and Juniata rivers.

I know this portion better, and it is so uniform in character that we can arrive at more definite conclusions from its consideration alone. It is a region of alternate mountain ridges and valleys, the former made up chiefly of rough sandstones, the latter, when large, of the lower silurian limestones, flanking which, and sometimes making a part of the mountain slopes, is a band of shale, the latter often making the floor of the smaller valleys or plateaus, regions for the most part, are only spasmodically cultivated. The underlying rock strata are nowhere horizontal, but are variously inclined, often at a high angle; and this, together with differences in the composition of strata, has determined great inequalities in the erosion or wear, and we find many cases of sharp, sudden passages from one kind of rock to another, and the rapid wear of some beds has left the more resistant ones as ridges, from which masses of rock have fallen from time to time and covered the slopes below.

The rainfall over this area is probably about thirty-one inches per year, and its altitude from eight to fifteen hundred feet. Originally the whole was thickly wooded. Tradition speaks of treeless districts, but they were probably limited in size as well as in time. Settlements naturally took up the limestone valley land, and later such other as was suitable for cultivation. So that, broadly speaking, there were two kinds of land. Valley land which was chiefly cultivated, and mountain land which was uncultivated and in forest. This distinction still remains, only more intensified, probably never before has so much of the valley land been under cultivation, nor so much of the mountain land forest, or rather perhaps waste land, since much of it has been culled over and then abandoned to nature. Assuming then that time has demonstrated the value of the one for continuous cultivation and the other as of no value for this purpose, we may drop any further consideration of the former and turn our attention to the latter.

The problem then is what is the condition and character of these mountain lands, and what can be done with them? Roughly speaking they comprise one-third of the surface under consideration. They vary from the steep slopes, covered by huge angular blocks of sandstone, to the "benches" and "kettles" of gravelly or shaly, thin and rather poor soil. They are covered in some places by a growth of good timber preserved by reason of its inaccessibility, in others by a hap hazard, irregular second growth of limited value, in still others the blackened tree trunks show but too plainly the fearful ravages made by forest fires, and the small encouragement which there is to attempt to prevent them under present conditions. Lumbering, in some one or more of its different forms, is carried on wherever it can be done at a profit. New methods of working and new demands have made feasible and profitable the use of much material, which half a century ago would have been left to rot or burn. Nevertheless the percentage of waste is still large, inordinately large from the standpoint of an outsider, who is astonished at every turn to see the amount which is cast aside. The sole reason for this is, that it will not pay to handle it. The cheapness of coal, its superior value and greater ease of handling, make unprofitable the utilization of this residue any further than is done. Slowly, but steadily, the usable timber is being removed from this whole district. What then is to become of it? Unlike the valley region, it is not susceptible to cultivation. Even where this is possible, it ought to be discouraged for two reasons. First, because there is an abundance of other land on which a man can make a better living, and, second, because this is much better adapted to forestry than to anything else. The attempts heretofore made at cultivation have been spasmodic and generally ended in partial, if not complete abandonment, as changed conditions have rendered unprofitable many of the small hand industries, with which the pioneers eked out a subsistence half a century ago. Its capacity for forestry has never received any attention whatever. It seems to be generally assumed by lumbermen and land owners that there is nothing to do but make the most of what can be stripped from it, then abandon it to nature, and let it take care of itself. Suppose that this region is to be reforested, how is it to be done? and to what advantage? It may be done naturally or by artificial means, or by a combination of the two. Natural reforesting will generally take place over any recently cleared wood land in time; but it is liable to be unequal in respect of the number of trees on a given surface and of the varieties produced, and to require a long time. In order to make the best growth, trees should start close together and cover the ground thickly. They thus protect the ground from undue wear, and the struggle for existence causes them to grow straight and tall. A great difficulty with this natural method alone is, that for several reasons this second growth is not dense enough and starts unequally. The older trees thus get the advantage and keep down others. The result is a small number of very strong, but rather bushy topped trees interspersed with younger growth, which is kept weak and straggling by the overshadowing of the others. Moreover the second growth is generally of different species from the first and often of undesirable species. This, which has been sagely observed as nature's law, is due solely to the fact that certain seeds get in ahead of others, and the young trees are strong enough to keep the lead thus gained, and not to an exhaustion of the soil which makes it impossible for the same kind to make a second forest. There is no foundation for the popular idea that a hard-wood forest must follow a pine. The character of the succession may be complicated by the action of fire, which, however, seriously affects all attempts at reforesting. The natural method is much more successful in regions north of this, particularly in localities where maples and beeches are common trees, since they furnish seeds which are easily disseminated and quick to germinate. In order to get as large a number of trees as possible upon a given surface, and those kinds which are most valuable, it will ordinarily be necessary to aid nature somewhat. Complete reforesting by artificial planting of either seeds or young trees would in this case be a tedious and expensive process. I know of no instance in which it has been tried on a large scale except where the conditions were very different from those here considered. On the virgin lands of the west, and some sandy, easily worked regions on the sea coast, artificial planting has been undertaken, and has been successful. It has been demonstrated that trees can be raised on good land just as well as any other crop, provided due care and attention are given them. This can probably be done in Pennsylvania as well, but that it can be done profitably on our average farming land I do not believe. The cheap lands of the west and the sand wastes of the coast may be so used, but it would be useless for us to attempt it, the more so since we have so large an area of this mountain land, which can scarcely be used for anything except forest, and we ought to bend all our efforts toward making it as productive and valuable for forest purposes as it is possible to do. Since so little has been done toward artificial reforesting such a district, we must look to experiment to show us the most feasible and inexpensive method of getting a close stand of desirable trees. This problem should be worked out by actual trial on the ground. It will cost something, and some trials will be failures, but there are good reasons for believing that it can be done, and at a moderate cost. The great difficulty will be at the start, and in adopting the methods employed to the local peculiarities. These lands vary, as stated, from those having a fine compact soil to such as are covered by huge fallen rocks, and no one method will answer for them all. If the former are not already supporting some tree growth they could be rudely broken up by ploughing occasional furrows in which the seedling trees could be planted, or the seeds if they are used could find a foothold. This is the method which has been employed in the plantations on the sea coast, and it answered the purpose. Where, however, there is already some tree growth, or the ground stony or obstructed, the preparation must needs be done by hand—to our minds an exceedingly slow process. But if the desired end can be attained, *i. e.*, the uniform stand of young trees, we ought not to be deterred on this account. Once well done it is done for a long time. It will be many years before it need be repeated. The use of the gravelly and stony-surfaced parts will depend somewhat upon their situation, exposure and moisture. When they have been stripped of their tree covering and fire has swept over them and destroyed the smaller growth, leaving nothing but the stones themselves, they present the most forbidding aspect. One would say that they could never be made to support any vegetable growth, small or large. But watch them for a time. They soon show signs of plant life here and there, wherever there are hollows in which moisture, dust and leaves collect. A coating of lichens and mosses follows. Then flowering plants, brambles and scrubby species. Lastly, tree seedlings appear, sometimes quite thickly, and though they do not grow so rapidly, nor acquire so large a size as those with more congenial surroundings, yet they often make very fair trees. The secret of this lies in the fact that these loose rocks have fallen from a higher level where they have been undermined. Such a rock-strewn surface is not a correct index of what is beneath. In places where excavation has been made there are often found several feet of loose gravel and earth covered and concealed by the large rock boulders. If the roots once get well fixed in this underlying gravelly soil they can support the growing trees provided there is sufficient moisture. The proof of this may be found at various places, and frequently a good growth of timber exists or has existed where the surface when examined is found of the character described. Sooner or later fire goes over such places after the track of the lumberman every few years, and this fully accounts for their utterly desolate appearance. All stages of such forest growth, decay and repair, can be seen at various places in the Seven Mountain of Centre and Mifflin counties, and much of the horribly desolate, rock-tumbled higher slopes once bore a thrifty forest. Fire destroyed it. This opened the way to, and left unhindered, the destructive action of water and air. Recuperation, under such conditions, was necessarily spasmodic and imperfect. Some parts are apparently irreclaimable. The process has gone so far that it seems entirely useless to try and do anything until nature has worked over them for a century or two herself; but with others, not so bad. I believe that acting on the hints obtained by this natural reforesting we may be able to accomplish much by planting seeding trees and seeds in whatever places are suitable. I do not suppose that this suggestion will meet with much favor among practical men. The planting of forest trees seems to most persons a chimerical project. Look at the time involved, the prices of timber and the great quantities yet untouched! These ideas are so firmly rooted in the minds of people that it is not easy to convince them of the need or feasibility of it. Moreover, as a people, we are still influenced by the idea that we have boundless resources; that if one thing fails us another can be put in its place, and that we cannot afford to invest our labor and our means in any project which will not yield a speedy return. Some individuals of means and energy may be willing to make a trial, if the way can be made plain to them, and I look to our experiment stations to do this. These newly established aids to scientific agriculture are just now getting a good deal of gratuitous advice as to the nature and scope of their work, and I make bold to suggest that the claims of forestry ought not to be ignored. There is some popular interest in this subject and nothing would so conclusively show the great value which this mountain region may yet be to us, as the attempt to clothe these waste lands anew with trees, utilizing them for the purpose to which they are naturally best adapted. It would not involve great expense, even should it prove unsuccessful, and although many years are necessary to produce trees of usable size, a few years only would show whether or not certain methods would give the stand of trees which it is necessary to secure. Let us select a spot which will give fair average conditions. Let us try the sowing of seeds, if on due examination that should prove feasible, plant directly if any parts should seem to be adapted to that method and aid the sprout growth by occasional additions where it is scant, and by thinning where it is too thick. The particular kind of trees to be used would depend in great measure upon the condition of the surface, but it is probable that place could be found for all those which we esteem of most value. Seeds and seedlings of almost all our trees can now be had at a surprisingly low price. If these trials should prove impracticable for people in general, because of the expense incurred or other reasons, then we must fall back on natural reforesting, uncertain and unsatisfactory as that may appear. The success of the natural process would be more nearly assured if owners and lumbermen could be induced to have some regard to the future of these lands and to regulate their methods accordingly. The indiscriminate cutting of large tracts at once exposes them to danger from several sources, prevents or retards the natural seeding which ought to take place, and in general is unfavorable to easy reforesting. Of the contingencies to guard against that which is of the greatest effect, and, unfortunately, the most difficult to manage, is the forest fire. What this amounts to I need not occupy the time to rehearse since it has been done so often. Suffice it to say that what fire is to property in houses, factories and buildings of various kinds it is to forest property—with this difference that relatively it is a more frequent danger to the latter than to the former, and a more destructive one because of the lack of any efficient watch-guards or means for prevention or control. It is to-day the most serious drawback to any plan for improvement in forest management. The man of business says in effect what guaranty have I that if I sow and plant the forest fire will not reap? and we are obliged to answer none. For, though we have laws on the subject, they are notoriously insufficient to meet the conditions in the case. It seems to me that nothing short of a system of patrol or forest wardens will meet these conditions. Within such a district as this under consideration a system could be established to be in active operation only during such part of the year as rendered it necessary, during the rest of the time to be subject to the call and direction of a responsible chief. This may seem to be adding to the machinery and expense of government, but is there not the same need for the protection of property in forests as of property in any other form? There are further some incidental advantages in making this mountain region one of forests, and they should not be lost sight of. There has been, for a long time, an impression that forests exert some sort of an influence on climate, but what that influence is has never been distinctly known. Some extravagant claims have been made which have no warrant in scientific demonstration. But the mechanical protection afforded by them is undoubted, and in respect of their effect in holding back snow and water, and thus regulating the flow of streams, they serve a purpose which cannot be performed by anything else. Snow is more uniformly distributed in a wooded region and resists melting longer, particularly during times of thawing in midwinter, which frequently carry off all the snow upon open ground. In one respect the regulation of the water supply here is somewhat different from what it is in other places

We find that the drainage is largely underground, for flowing out of this mountain district are comparatively few and small streams, and many of these sink shortly after they reach the valley to reappear again farther on in the great springs so characteristic of the thick limestone formations through which their waters have passed. Underground drainage, however, begins in the mountains themselves. Let the mountains become barren wastes of rock, and the water will not only run from their slopes as from a roof, but the underground streams and springs will fluctuate to such an extent as to make them an unsatisfactory dependence. The old saying has it "the mill does not grind with the water which has passed," and if our mountains are richly covered with growing trees these latter will abstract from the falling rain and the percolating waters sufficient for their needs and wrest a first service which the uncovered lands could not exact. To use to the fullest extent the forces and products of nature is wherein the civilized man is distinguished from the barbarian. One by one the forces of nature have been harnessed and made to serve our bidding. Our water supply should yield its toll likewise, the sooner the better, and the greater will be the gain. I will not longer trespass upon the time to set forth the general needs and advantages of forestry. They have been written upon so many times and so well by others that it is unnecessary to repeat. Rather let me summarize briefly their reference and application to the locality under our consideration. I have endeavored to show that the natural adaptability of the ridges and smaller mountain valleys of Central Pennsylvania to forest production is so great that effort should be made to keep them continuously for this purpose. That their cultivation should be discouraged as unprofitable compared with other lands, and that so soon as they become cleared of their natural timber effort should be made either to protect and add to the new growth or to seed and plant directly for this purpose. That the interests at stake are of such importance as to warrant trial and experiment of the methods best fitted for such work. That for protection we need some efficient legislation to reduce the great risk from fire, and that this is so important to success in forestry that if necessary a system of partial patrol or watching should be undertaken, even though it would require some expense in the maintenance, the more so since the incidental advantages of keeping this region forest-clad are very great, and directly affect the prosperity of all our people. And lastly, albeit it may be considered but a sentimental consideration, a just pride should constrain us to use the trust which Providence has committed to us without abusing them, and to hand them over to our successors unimpaired. This is a test of the highest civilization, lack of it marks the barbarian.

PRACTICAL FORESTRY.

By Thomas Meehan, *Botanist of the Board, Germantown, Pa.*

[An address at the annual meeting.]

The subject of forestry in its relation to legislation has been set apart for a special discussion this afternoon, and I do not know that any wiser disposition of our time could be made, because legislators generally ask us as a body, and as a community at large, "What is it you want us to do for forests and forestry interests?" I know when Governor Hartranft was Chief Executive, and the newspapers especially were very urgent that he should present the claims of forestry to the Legislature, when he wanted to state what was required, and he looked around for information, nobody could tell him. And so it seems to-day. The Legislature of the State is perfectly willing to legislate upon forestry if only we can agree upon some general plan upon which they can legislate. It therefore becomes us to suggest a plan in order that the Legislature may aid us on the subject of forestry. It is for that reason that when called upon to speak to you this afternoon I chose the subject of "Practical Forestry." It seemed to me that if I could point out to you what is needed to encourage the planting of forests, and in what respects the forestry desires encouragement from the Legislature; if we could find what the community is willing to do, and if we could say in what particular lines their wishes were practicable, and could point out to the Legislatures of this State and other States what can be done, that we will have accomplished some good purpose.

Now, to put this in a direct light, I will suppose myself an individual owning thirty or forty thousand acres of woodland. I naturally want to turn it to some profit and make some reasonable use of the ground. That is the first thing naturally—a man wants to make the best use he can of his property. I must know that the more densely populated the country, the more profitable my land becomes to me, and the less value the land has usually, the scarcer population. If I could bring population upon that land, build up communities around me, it would increase the value of the land materially; but if I leave this forty thousand acres of land in forests, I lose the profit which dense populations bring. You have to bring me some strong reason why I should be induced to let that remain in forest and lose all the great profits which dense population brings. You appeal to my patriotism. You say to me, "You ought not to destroy your forests. There is a question of public policy and climate involved if you cut down and clear away that forest. The rainfall will be less than before, springs will dry up, the rivers will be shallow and navigation obstructed. It seems to us you owe this to posterity to sacrifice your individual rights in their behalf, and instead of clearing land and of bringing population here, you ought to let it stand a naked wilderness for the sake of posterity and for the sake of the climate and the future of the country." I may ask, as once did a celebrated politician when urged to do something for future generations, "What has posterity done for me?" or I may take the ground that I do owe something to posterity and sacrifice my private interests to public duty and let the forest remain; but if I am to be patriotic and sacrifice for the future, I am justified in demanding that that question, as presented to me, is a real and not an imaginary one. You tell me that by clearing away my forest of forty thousand acres the rainfall would be decreased, and I ask for the figures. I read history and find in it that once England was a land thickly covered with forests, and especially so when Cæsar and the Germans came there centuries ago; that now only three per cent. of forest is left there of what was once the original forest covering the whole land. I see whatever else has resulted, thousands upon thousands of people are enjoying the pleasures of living there who could not if that country had remained a dense forest, and I ask the question whether it would not be better for people to live on the land to the extent of thousands and millions than not at all, even should the result be dryer land by the denuded forest hills, and see whether we have not lessened waterfall in consequence of having less forest. But I read on and find that there is just as much rainfall there as ever before, and that navigation is not impeded, and that there is as much freedom from drought as there was in the time of Cæsar or the time of the Germans. I may pass over to Ireland and see the same thing there. The dense forests the Milesians and St. Patrick found have since disappeared—trees cut away to as great an extent as in any part of the world, yet to-day the country is as moist and the whole rainfall is as much as when the earth was covered with forest. Leaving the Old World, I come to the New, and inquire what are the effects there? Has the climate been affected by cutting away the forests? I should know all this surely if I am to sacrifice my individual feelings and benefits on account of this public good, which requires me to preserve the atmospheric moisture. Notwithstanding the results in the Old World, if you can prove that the climate of America is really affected by cutting away the forests, then probably I may sacrifice my opportunity of acquiring riches by allowing these thirty or forty thousand acres of forest land to stand. There are very few States where the statistics have been long kept, but there is one—that is Ohio. That was densely covered with forests, and the lumberman's paradise, so densely was it wooded. While probably not five per cent. of the State of Ohio is under forest to-day, yet they have the same amount of rainfall, or with scarcely any perceptible diminution, as the careful statistics prepared at Marietta show.

Then to come to our own State; take the Schuylkill river. As much water flows into that river as when the country was first settled. It was attempted by a city engineer, to show that the water was less in the summer, though the whole during the year was the same, but this also failed. The figures were rather in the favor of cutting away the forests. In fact it was shown that in one decade more water came down the Schuylkill river than in summer before the trees were cut away.

Even in the Western States the figures do not show less rainfall after forests had been cut away, so far as modern figures can show them. With plenty of timber in some localities, the settlers have had to cut it away. To such a great extent have the forests of the Rocky Mountain been cut in ten years, that from the time of my first visit, not many years ago, and the time of my second trip through that section, I hardly recognized the face of the country; yet the wet area seems to be getting nearer the Rocky Mountains than before. The area fit for cultivation is approaching nearer the Rocky Mountains from the east, notwithstanding the cutting away of the forests there. Going towards Utah, you find nearly every strip of timber is being cut away in the Wahsatch hills. But there is a great deal more rain and moisture at Salt Lake City, and the lake itself is rising, and so the figures do not bear out the argument on the score of patriotism that I, as the owner of thirty or forty thousand acres of land, am asked to consider.

Suppose, however, all these figures were correct, suppose, in some way, I can be made to believe that the cutting away of forests has some influence on climate, and that there is something in the argument that I should preserve these forests for the benefit of posterity. When I look at a forest I find that the profitable life of a tree is only one hundred years. As soon as a tree reaches maturity it ought to be cut, if at all, and before it commences to decay, it is not fit for the lumberman's axe when dead wood forms about it, and, so far as the profit from the tree is concerned, it should be cut out, if we are going to cut it at any time. When you tell me, as the owner of thirty or forty thousand acres, I must preserve the forest, I am justified in asking, "how long should I keep these? when and how should I cut them?" It seems to me that is deserving of some practical answer.

I have said that as soon as a timber tree reaches one hundred years it commences to decay, but this is in proportion to the thinness of the soil and the difficulty the tree has in getting food. Where a tree is growing on an open, level tract of land, with great depth of soil, it may live four or five hundred years and flourish; but a tree in the forest, where it has a struggle for life and a struggle for food—for be it remembered a tree needs sustenance for life as well as a crop of corn or potatoes, and the chief trouble it has is to get food sufficient in the contest with its neighbor—when it commences to decay, there is a large amount of underbrush accumulated, inviting fire, and it is almost impossible to prevent fire under such circumstances. No matter how much you do, whether you employ wardens, or legislate against railroads, or mischief makers, in some way or other the fire will come. With this decayed material and underbrush it is impossible to prevent a forest fire to some extent. When a tree gets so old that the whole underbrush is only a dead mass. the sooner it is cleared away as threatening the community the better. So I hardly know what is devolving upon me as the owner of thirty or forty thousand acres for the benefit of posterity. Am I saving the forest and losing millions only to feed a future forest fire?

But some will say when the tree gets to be one hundred years old we will permit you to cut the forest—that this is a feature the government will have some control over, the forestry commission shall decide, and the owner of property will know when and how he should cut his timber—and we will be told, too, how to clear it all away and how to care for the second crop. But I think that every practical man that looks at the forestry question must say that the second crop amounts to just nothing at all. Four or five sprouts will come up where one strong, sturdy tree grew before; and the whole mass is so thick with branches and leaves, that it is impossible for any valuable timber to grow, as in the forests where they had been cut down. And not only this, but underbrush of various kinds and growths check and prevent the growth of the timber desired.

Few have any idea how thoroughly useless is a thick forest grove. Take, for instance, the forests of Alaska. We were told that Alaska would be a good purchase for us, if it would be only on account of its timber; that the whole country is an immense forest. I was amazed to see the timber there almost practically worthless, on account of the manner in which the trees had grown up close together. The atmosphere is so moist that the trees get a larger amount of food than in the Eastern States. The climate is good. There is no such demand for food by the roots as in the Eastern States; no resistance or force against the tree doing its work on account of the moist atmosphere. The consequence is that the trees are so thick that it is almost impossible to walk through them, but in size hardly thick enough for fence posts. Yet with the grand climate itself, if the trees had been thinned, or the trees had actually grown thinner, there would have been good results, as in some cases, where the trees were isolated from each other, I saw them one hundred feet high and twenty feet in circumference. So that in northern regions, if some care were given, we might have good forests; but on account of the thickness of the trees, growing thus together, the timber of a second growth is utterly worthless. The growing up so thickly together will make a second forest comparatively worthless. I need not go to Alaska to see these things, or far away from this locality. A trip from Harrisburg to Philadelphia would teach any one with an observing eye what I am attempting to make plain to you here. You can see along the railroad second growths of twenty-five to thirty years commencing to decay already, and in some places making up one-half of the woods, although the trunks are little more than one foot in thickness, with the dead and dying; and the first forest fire will sweep the whole thing out of existence, which it would never do in a well-cared for forest of large first-growth trees.

It seems that something else than the patriotic argument ought to be used on the owner of those thirty or forty acres of land in order to induce him to retain that forest in its primitive condition. What those arguments are I have not heard. I do not know of a single argument to induce a man to retain that forest for any particular length of time.

Suppose they are not as worthlessly thick as I have represented, and the trunks of the trees are fair, and are not seventy-five to a hundred years old, and could be cut then, would that be profitable? We have to look at facts to determine the question of profit. A few years ago a man in Montgomery county bought a farm of about one hundred and twenty acres, and about one hundred acres cleared, at thirty dollars an acre. About one-fourth of the area, or a considerable portion at any rate, was very fine wood land, and just about fit for the lumberman's axe or saw. He sold the forest part of it for about eighty dollars an acre. People thought that paid at eighty dollars, when thirty dollars was all he paid for the whole; but it was thought thirty dollars high for the whole, and probably a thought of the timber raised the whole tract in price, so that a part of the wood profit went in the first cost of the farm. Suppose the land outside the forest was really worth thirty-five dollars an acre, would fifty dollars per acre pay the man to let that forest stand one hundred years? If you will figure it out, you will find it will not pay to get merely an advance of fifty dollars an acre on it. Those are practical questions that the owner of the land will ask you to settle before you can place the patriotism and profit before him as a conclusive argument to retain it.

Suppose I am the owner of thirty thousand acres of land that has no forest on it. You tell me in time the forests will be cleared away, and it will be profitable to plant timber to supply the market, and it will not be long before there is a scarcity of timber. Again I should want you to give me the facts. If you will look at the minutes of the American Philosophical Society, which have just been published, you will find that Benjamin Franklin prepared a communication in which he gave as a fact that the forests would be destroyed in seventeen years. Of course since that time railroads have been introduced and pushed into the forest area. But still there have been men following Franklin since the time railroads came into existence who have been giving the same prophecy that the time will soon come when lumber will bring a premium, and bring almost any price. But as civilization has increased, we are getting substitutes for wood. In Philadelphia for instance, because of the danger, no frame buildings are erected, and that alone has lessened the demand for lumber compared with what it was ten or twenty years ago. And so all over the State. And then the introduction of coal had a great deal to do with the prevention of the cutting of the supply of wood. And who can tell whether in fifty years we can get an enormous price for timber. Can you tell me, the owner of thirty or forty thousand acres of forest land, that my children, or posterity, will surely find a great demand, and get a fortune from my planting, although I may not? These are practical questions which have to be answered, and before we can get very far along in inducing people to largely plant.

No doubt there will always be a demand for timber; but that does not make any difference whether the timber has a relation to the rivers or streams. Timber will always pay some price, whether a profitable one or not of course depends on circumstances. Now I am inclined to think, as the owner of thirty or forty thousand acres of land, I should be tempted to cut away the the timber and farm it. If you insist I must not, then I have a right that I should ask the Government, How do you propose to help me along in this matter of profit which I will lose if I keep or plant forests to please you?

If the proper selection of trees are made, and the proper tree is fitted to the proper soil, and the whole cared for understandingly, it is remarkable how fast timber will grow. If there should be scarcity of trees, a careful cultivation will give us a new supply in twenty to twenty-five years. Some varieties will increase an inch in diameter a year. One-fourth of an inch is a fair average for trees standing in forests, and counting the growth during the entire life. But when you come to plant and cultivate them, the growth is very large, and you would be surprised at the difference. The oak is supposed to grow very slowly, and yet an oak will send its branches some times to the length of two to three feet in a year. I have been surprised with the growth of individual trees, where they had a fair chance to grow. I measured oaks three feet in circumference that had been planted as saplings only ten years. There is not much difference in the ratio of growth of our forest trees; it depends on the soil; they like some soils better than others. But as a rule the oak tree will increase certainly a quarter of an inch a year; at other times and other localities half an inch. Thus in twenty-five years you will have a fair sized tree, and in fifty years you will have trees large enough to supply any demand. Therefore if it came to the worst, and we should become destitute of lumber, or the price should get up too high for such lumber to be used, in twenty-five years we could grow all the timber we wanted. If it came to the worst, we would not be as badly off as some people think. What is true of oak, is true also of almost all kinds of wood. Therefore I think if I had thirty or forty thousand acres of forest land, I should not prevent it being cut away on account of the theoretical notions about forests and climate, but I should if you make it my interest that they should stand than by allowing them to be cut. Nor can forestry be served by scattering free trees everywhere, because the wrong trees will get in the wrong places. But yet I think planting forests properly would pay. I should, I think, investigate as to the particular localities most desirable for particular trees. I should find out what kinds of trees suited my particular localities, first by experiments for a year or two perhaps before I could decide. I think I would plant them twenty feet apart, and cultivate them, raising corn and potatoes between the rows, so as to get something for my money while they were growing; and while getting larger I should employ professional pruners to cut the lower branches off, as suggested by Mr. Oliver this morning. It is important to get a good growth of trunk. If the trees are planted closely, the branches are killed or weakened by the shade, but the dead fire-inviting brush is what we don't want. It is better to plant wide apart and get a product off the remainder of the land, and the trees as an extra growth by reason of being thin on the ground. This process of cultivating should be carried on at least two or three years, or longer, to keep down weeds and encourage rapid growth. Of course the branches should be carried away and destroyed. You do not want to carry on the cultivation too far; neither at first do you want the young trees to be injured or interfered with by cattle. But then, after the trees get large enough, I do not see any reason why cows or cattle should not be allowed to graze there, and you get some profit the whole time the land is in trees. In the Western States, where cattle were allowed to graze, they did no injury; it is only when the trees are quite small. This keeps down all dead brush, and is a security against forest fires. They browse under the branches, and there is no temptation or desire to get at the trees. Not being giraffes, they have not long enough necks to browse to any damage under the trees, except when quite young, when the branches extend out well, as they are quite low to the ground; but as the trees grow up, the cattle graze clear to the trunks, with no disposition to eat off the bark or leaves. With trees planted in that way, and with an income obtained from year to year in the manner I have indicated, they would pay for their cost. For a forest thus safe from fire I would be the gainer if I wanted to sell. Some person would give me the value of the land with the trees, although the trees themselves were not fit to cut, because the value point would soon be reached.

Now, I think in that way forestry planting might be made very desirable and very profitable; and some legislative inducement in that way, with the facts of profit properly presented, would cause people to spend more time and money in tree planting and would do good. But one of the most important things to be remembered is the right kind of tree in the right kind of soil, and in the right location. Forestry in our country has not been benefited by some attempts at forest planting. Ignorance of practical details have rather tended to discourage culture than to undertake it. For instance, in English and German works we read about the great value of the larch as a timber tree. The larch was supposed to be the best of all trees for various purposes.

German and French periodicals were for years full of the great value of this species as a forest tree; that it grew rapidly, and the wood useful for all sorts of purposes. So our western people went to work and planted large tracts through that country. After waiting twenty-five to thirty years, the timber, instead of being found as valuable as in the Old World, was practically worthless, as the larch requires a cool summer climate. Its home is in the mountains of Switzerland and Italy, and in a cool climate, where the sun is never very warm or very cold, but where the temperature is only rather warm and equable. Planted on the low and rich level plains of the West, where the soil was too rich for it, and where the summers were too long and the winters too cold, it was practically useless. That is one of the lessons we have to learn before we attempt to plant these thirty to forty thousand acres that I spoke of; and it is one of the expensive lessons we have learned in connection with the forestry question in our country.

Now, everyone, I think, must have noted, even by the most cursory observation, how trees suit themselves to different locations and different temperatures. When we travel, in nearly every country, as we rise, say but fifty feet in altitude, we find trees of one character, suited to that low land. As we ascend one thousand feet higher we find different varieties; and so until we come to the lines of perpetual snow. Nature tells us that trees have to have different temperatures, different altitudes, different soils, as may be required, in order to produce their best; and we have to bear these facts in mind when we go to plant our lands or large tracts for forestry purposes.

Now, I have given some reasons why we could hardly ask a man, the owner of thirty or forty thousand acres of forest land, to hold it for a number of years. In the first place he knows the land will increase more in value vithout being covered with trees. In fifty years the forest decays, and instead of being valuable for forest timber, he knows it is an inducement to forest fires. If he cuts it down, the brush that comes up afterward will only struggle for life, and he is uncertain in regard to the influence of trees on climate. Then if you come to ask him to plant, there is still that feeling that no matter how great the profit made on the land, no matter if he follows my suggestion to make something of a profit as he goes along, he would probably make a much greater profit if a population should settle there; and that is one reason why he cuts down his trees in order to increase the value of his land. By cutting away his trees, land that otherwise would bring $50 an acre, by bringing the population there, it would be increased to $100 an acre, and possibly to $200 or $300 an acre in much less time than it will increase $50 by the trees. So if the land were not planted in forests, I would be a great deal better off financially. We have, therefore, to look to legislation, I think, to help the man who wishes to plant a forest, to get some benefit out of it within a reasonable time. But I do not think one man will ever do it. I think it must be by association. I think that forests should be planted under charters, as a railroad company gets a charter, just as my friend on my left said awhile ago, so we can get some privileges commensurate with the loss. I think that is the only way by which legislation can help forestry. When that is done I think the stock in that association would always be at a premium. Certain trees would be coming towards market in course of time; and in a company like that the stock would be worth more ten or fifteen years after it was in operation than when the trees were first planted; so that if a person wanted to sell out his stock he could get full value for it, under a charter, working in that way, and the Legislature might give the money it is proposed to waste in commissions, on experimental farms, on teachers and lecturers and free trees, to guarantee a five per cent. dividend for the first five or ten years on the stock.

I have listened attentively to what others have said; but I do not think any person named a practically operative plan as I have. I do not think that the State, taking hold of the forestry question as proposed can realize anything out of it. Matters with us are entirely too changeable. In spite of all we can do, we cannot get a practical man to take hold of a matter of this kind for a series of years, under government control. Persons do not make life officers of their work, as they do in the Old World; but they are ever on the lookout for something better, and they will abandon forestry in a few years for something else, for sooner or later there will be a feeling that at something else they can do better. Similar changes are continually taking place in our State and in our country. Where a State has undertaken to carry out any public enterprise, it has been glad to get rid of it. In Pennsylvania, where they owned the public works, they were glad to get rid of them. So far as I know, to-day Pennsylvania has disposed of all her public works; and so with most of the States. So that if even the different States can do this with a less burden than under private management, sooner or later it will come to companies any how; of course some good will come from a forestry station; some from a Forestry Commissioner, especially if that commissioner would apply himself to collecting statistics on such subjects as the relation of climate and soil and location to forestry, and do his level best to extend a knowledge of correct tree culture among the people. A Forestry Commissioner of that kind would do great good. Teaching of forestry matters properly in schools would undoubtedly be a benefit. Arbor Day is a good thing, in encouraging the planting of trees, instilling into the minds of children the importance of tree planting and tree culture. The Forestry Association is doing a good work, and can accomplish an immense amount of good. But the great good yet to be accomplished, is the getting of chartered associations to take hold of large tracts for new forests to take the place of old tracts. But the most important question of all is that involved in the joining together of persons in the manner I have suggested, with the advantages of a charter and concession, to make the work certainly profitable to be derived from the Legislature.

FENCES—THEIR COST, DURABILITY AND UTILITY.

By Eastburn Reeder, *Member from Bucks.*

Let us ascertain their cost upon a farm of a given size. As an illustration we will take a farm of one hundred and sixty acres of land, or a quarter of a section. I find by accurate calculation to fence such a farm properly, requires over two thousand panels of fence, allowing ten feet to each panel. In a quarter section farm the four sides will each be half a mile in length. Two of these sides will be road fences, and the other two line or partition fences. One of these line fences will be made by the adjoining land owner, so that will leave us a mile and a half of outside fence, or 792 panels = 7,920 feet in length. The inside fences dividing the farm into eight enclosures of twenty acres each, with two lanes from the buildings, one to each public road, will require 1,386 panels = 13,860 feet in length. Having now determined the amount of fencing necessary, we will next consider the cost, taking the ordinary post and four rail fence.

At present prices posts are worth twelve cents and rails ten cents each, making fifty-two cents for material. The cost of making the fence will be about as follows: Making the posts, eight cents, and pointing the rails, two cents each, making sixteen cents for getting the material ready. To this must be added eight cents more for setting the fence, this will make it foot up as follows:

Cost of material per panel,	52 cents.
Cost of labor per panel,	24 cents.
Total cost per panel,	76 cents.

A few years ago when labor and material were higher, when posts, were worth eighteen or twenty cents, and rails sixteen cents, and the cost for labor of making and setting the fence thirty cents a panel, the total cost would be from $1.12 to $1.14 each per panel. This makes the total cost of fencing a farm of one hundred and sixty acres, containing 2,244 panels, at seventy-six cents per panel (present prices) amount to $1,705 44. At former prices of $1.12 per panel to $2,513 28.

The annual subsequent cost for repairs will depend in a great measure upon the durability of the timber. The rails will last a life time, but the posts will rot in from ten to twenty years. An average will probably be fifteen years, and this will necessitate an annual re-setting of one hundred and fifty panels of fence, at a cost of twenty-six cents per panel, or forty dollars.

Worm Fences.

The worm fence is perhaps the most primitive of fences. It requires more lumber in its construction, and is the kind of fence adopted in new countries where timber is plenty; and how to get rid of it is one of the main objects. The old law of 1700, so often referred to by Mr. Beebe at our meetings, required that the fence should be made "of logs or rails, five feet high, and close at the bottom." This kind of fence occupies more ground, as well as more timber In zig-zag fences, where the deviation is two feet each way from the center line of the fence, the panels will fall short about one foot in ten. Rails eleven feet long, which will make a panel of post fence ten feet long, will not extend more than nine feet in the direct center line of the fence. If, therefore, we add one-tenth to the 2,244 panels of post fence, we shall have 2,468 panels of worm fence as the equivalent. Worm fences are usually built seven rails high, with two stakes to each panel. This will require for our farm of one hundred and sixty acres, with its 2,478 pannels of worm fence, 17,276 rails and 4,936 stakes. These, at a cost of ten cents for the rails and six cents for the stakes, will amount to $2,023.76 for the material alone. The objections to this kind of fence are threefold: 1st, the amount of ground covered by the fence; 2d, the liability of being blown down; 3d, the harbor afforded for briars and weeds. It is estimated that the worm fence, as usually constructed, takes from every one hundred acres, an area of five acres.

Board Fences.

The construction of board fences varies with circumstances. The usual board fence is of rails sixteen feet long and six inches wide. These may be of hemlock, pine, chestnut or oak. They are nailed to flattened posts planted eight feet apart. The cost of such a fence depends mainly upon the value of the timber used for rails. The cost of a four board fence, I should estimate as follows:

Forty feet of hemlock fencing at $2.00 per hundred, ...	$ 0.80
Two posts at 12 cents, ...	24
Nails, ...	01
Labor, ...	05
Cost per rod, ...	$1.10

Durability.

The durability of wooden fences depends upon several conditions. The stability of the worm fence is at the mercy of the winds, and no calculation can be made upon it. The durability of the post and rail fence depends upon the kind and quality of the timber, the character of the soil, and perhaps other conditions. I have known posts made of young chestnut to rot in ten years; and I have known posts made of old white oaks to last for twenty-five years. To make posts last in the ground, various methods have been employed; coating with lime or gas tar, and charring the butts with fire. Some say it makes a great difference to plant the posts with the top in the ground.

Utility.

The great objection to wooden fences is their cost and their perishable character. Their utility has been greatly diminished by the introduction of wire fences. A few years ago, owing to the increasing scarcity of timber, the price of good chestnut rails and posts had run up to sixteen and twenty dollars a hundred. Since the introduction of wire for fencing purposes, notwithstanding the scarcity of timber, the prices of rails and posts has fallen at least twenty-five per cent.

The advantages claimed for the wire fences are thus enumerated: It is cheap, as compared with other fences; it is strong, every strand will support a great weight; it is effective, all kinds of stock let it alone; it is easily built with a few simple tools; it is durable, does not corrode, cannot be burned, blown down, washed away, stolen for fuel; it economizes space, and wastes no valuable land; it is cleanly, does not shelter briars and weeds; it stands well, resists changes of wind and temperature; it is convenient, taking all things into consideration; it is impregnable, to all classes of trespassers; it affords no barrier to the snow and avoids drifted roads; it needs but to be legalized, to make it the universal or World's fence.

THE EDUCATION OF FARMERS.

By Joseph Painter, *Member from Armstrong, Kittanning, Pa.*

It is not necessary to define the word "education." We all understand what that means. The "education of farmers" should differ but little, if any, from the education of any other class of artisans. It is simply the expanding of the mind, the gathering of information and the practical application of the knowledge obtained.

If we would have educated farmers we must apply the same rules to them that we do the followers of other avocations in life. The minister, the jurist and the physician, must each pass through a special course of study in order to prepare for his profession; and not only this, but if he expects to be successful, continue that course of study throughout the practice of his profession. He takes advantage of the discoveries and intelligence of leading men wherever it will help him, and goes down into the researches made by others in order to store his mind with knowledge. Take the successful business men of our day and who are they, and how have they achieved success? I answer in two words, by education. Many of them almost unlettered, without the advantage of a college or even a commercial training have fought their way, step by step, until they have become eminently successful. But were they uneducated? No, their education consisted in understanding the principles of the business in which they engaged, and the strict adherence to that which is practical. They were deep thinkers, close observers and kept themselves thoroughly informed on everything that pertained to or affected their business. They took advantage of every means of information that came in their way, and always were well informed in the movements of the business world.

Consider for a moment the railway system of our country. The men controlling it have been educated in each particular branch of the business. They have developed it, step by step, until now its great strides no longer excite surprise. And yet the most wonderful feature of the whole system is the systematized plan of work. The building of a new line of road, the repairing of an old one, or the grading of a mountain is brought down to a mathematical calculation. Its managers can tell each year what will be gained or lost by tunnelling a hill or going round it. What will be the advantage of using different kinds of rails or other material. What kind of bridge is best to use at a certain place, and a thousand other things that enter into the details of the work. The secret of it is that they are educated in railway management.

The farmer who expects to succeed must be an educated farmer. He must bring farming down to a system and understand exactly what he is doing. The man who has neither the brain nor the energy to succeed in any other occupation in life will never be a successful farmer. Let the farmer be educated in farming, just as men in other avocations in life are educated in their particular business, and it will revolutionize the present system of husbandry in our country. Let farming be reduced to business principles and the question of expenses, of profit and loss thoroughly understood, and the farmer will soon come to understand what production is profitable and what is not. We are not advocating fancy farming, nor what is called book farming, but we do urge the intelligent raising of grain and stock. We insist that every farmer should be able to give the same idea of the advantages of raising the different kinds of grain or stock that men in other branches of business have been able to give of the various details of their business. Not a mere assertion that he prefers this or that kind of grain or this or that kind of stock, but his judgment should be be based on the carefully studied facts of his experience. The farmer should be able to render as clear and as intelligent an account of his business as the merchant, manufacturer or railway manager.

The iron master can tell you what he can produce the different metals for, tracing each process from the time the ore leaves the hill. The manufacturer can tell you what he can produce the different kinds of cloth for, tracing the cost from the time the wool is clipped or the cotton taken from the field. Why should not the farmer be able to give a like account and calculation of all his products? The effects of the season may vary the yield and price of the different products, but the comparative profits of the different grains and stock are something which every farmer should be able to give and fully understand.

How necessary it is that farmers should understand and know, not only how to keep their ground in good condition, but also the particular crop best suited to different kinds of soil. Also how necessary it is that they should know what are the exhaustive qualities of the different crops. How many of them are able to give you a calculation of the actual cost per bushel for raising the various kinds of grain, or the actual cost per head of raising the different kinds of stock on an average Pennsylvania farm? And yet until they understand these matters, and are able to give these calculations, they are not entitled to be called educated farmers. One may tell you that it is more profitable to raise a certain kind of grain or stock, but when he is requested to give you the calculation showing the facts and figures for his statement, he shows then his lack of knowledge of the details of his business. Unless a farmer is able to show such facts, how can he know that one grain or stock is the more profitable for him to raise?

It is not a question of raising a little of everything, but of raising that which, under his particular circumstances, will yield the most profit.

Farming has been too much regarded as a business requiring only bone and muscle, in which ability to maul rails, pitch hay or plow a straight furrow were the chief accomplishments. Our farmers must realize that labor is not the only essential, they must recognize that good management is the touchstone of success on the farm as well as in the factory. They must understand what they are doing. They must acquire knowledge, not from books alone, but from observation and experience. The educated farmer will combine all these. He will experiment just as the chemist does. He must be observant just as the student of nature. He must keep himself posted upon all the advanced ideas of the most intelligent farmers of the country, and by actual tests and experiments of his own, demonstrate whether their ideas are correct or not. He should read and re-read the standard farming journals of the country, just as business men daily read and watch for the reports in their particular branch of trade.

The education of farmers does not necessarily mean a regular course in college or other institution of learning. It does not mean their advocacy of every visionary idea advanced by theorist. It does not mean book farming even, as that is limited; but it does mean the reducing of farming to practical business principles. Of raising the farmer up to the standard of excellence at which he will understand how to farm systematically and intelligently. When this is accomplished, farmers will understand that failures of crops rest more with themselves than with Providence, and their occupation will take its place as one of the most honorable avocations of life. It will then no longer be a synonym of illiteracy to be called a " hay seed " or " feeder of calves," but to be called a farmer will be a recognition as one of the intelligent and substantial citizens of the land.

FARMERS' FIRE INSURANCE.

By W. H. KNOUSE, *McAllisterville, Pa.*

Reciprocal operation is one of the essentials absolutely indispensable in any community, country or nation. In the history of all ages we learn that where mutual coöperation was most prominent, there the affairs of government and trade prospered most. The precepts of sages and philanthropists in all ages, and especially the teachings of Holy Writ enjoins the strong to bear the burdens of the weak, the rich to help the poor and the fortunate to aid the unfortunate. To facilitate the obedient performance of these duties of charity and love of one toward another, in nearly all civilized countries governmental institutions have been established, but since the management of these often fall into the hands of Tweeds, Shepherds, Phippses and similar others, whose greed and avarice bring about an unsuccessful consummation. therefore philanthropists have in many instances accomplished greater good through independent effort than the largest government institutions backed by thousands of appropriations of public funds.

Among the many and various institutions of charity we find those of a reciprocal character, among which may be classed insurance companies, and since all are familiar with the interest and purposes of these organizations, I will not enter upon any detailed explanation thereof, and since fire insurance is the topic of this discourse, will pass by all others; not, however, discarding their expedience and general utility. If it were possible to have extant in any community a spirit of brotherly love that would induce all to "do unto others even as they would that others should do unto them," that community would have no need of a fire insurance company, for then, in case of one of their number having his property destroyed by fire, each, prompted by that feeling, would at once contribute according to his ability until the loss of the unfortunate neighbor was completely covered. But since religious denominations, that have such a mandate incorporated into their church discipline, fail to carry out this principle, it would be useless to expect it from any other class, and it would, therefore, almost appear as if fire insurance companies have become a necessity; and in order to give them stability they must inevitably be established and regulated in accordance with legislative enactment, but are at the same time, if properly considered, reciprocal, *i. e.*, as among individuals—I'll help you and you'll help me, or we will protect each other. But we find that people generally entertain a mistaken idea upon this point, for when the agent of some insurance company approaches an individual with a solicitation to take a risk on his property, the only incentive, in nine cases out of ten, that will induce that individual to recognize insurance at all is the fear of having his own property destroyed by fire, never for a moment taking into consideration that the pittance often so grudgingly given, is largely applied to the relief of some one who has been or may be similarly unfortunate. Even courts of justice, so called, especially juries, often incline to consider insurance companies as "bodies without souls," and a preconceived and unfounded prejudice often predominates over strong evidence in determining a suit at law; while it must be admitted that, if honestly and honorably conducted, they are truly beneficial and charitable institutions. That there is not in many cases an enormous speculation conducted at the expense of the insured and to the benefit of the stockholders and officers of certain joint-stock companieiss not to be denied. For instance, a certain number of individuals enter into an agreement, or articles of association, for the purpose of organizing a joint-stock fire insurance company, in accordance with the laws of the State of Pennsylvania. They fix upon an amount of capital stock that the company shall have, which by law cannot be less than $100,000, minimum, no maximum is fixed. They open books to receive stock subscriptions, and as soon as the minimum of $100,000 has been secured, letters patent can issue, or in other words they can secure a charter and engage in the business of fire insurance. So far all seems circumspect with due regard and caution to prevent fraud and unjust speculation, but in another section of the insurance laws of the State provision has been made whereby companies may increase their capital stock, which may be done by increasing the number of shares of stock, or by increasing the par value of the same, and such increased shares or increased par value shall be alloted *pro rata* to the stockholders of the company according to their interest, *i. e.*, according to the amount of stock they already own, and may be paid in whole or in part out of the accumulated reserve of the company, in case the condition of the company warrants such allotments. No portion of the funds of a company can however be regarded as accumulated reserve subject to such allotments, except such amount as may remain after charging the entire amount of premium receipts on undetermined policies, in addition to capital stock and all other liabilities of the company.

Now let us, for example, examine the statistics of the American Fire Insurance Company of Philadelphia, the name of which is probably more familiar to those present than that of any other joint-stock company in the State. In the report of December 31, 1885, it reported a paid up cash capital of $400,000, and a year later, December 31, 1886, it reports cash capital paid up of $500,000, an increase of $100,000 during the year. Its assets at the last annual report, December 31, 1886, consisted of—

Real estate unencumbered,	$185,673 00	
Loans on bonds and mortgages,	728,039 50	
Interest due on same,	11,395 70	
Stocks and bonds owned by company, market value,	1,162,417 42	
Loans on stocks, collateral,	72,900 00	
Cash in office and in national banks,	99,761 94	
Other assets,	41,671 10	
Total assets December 31, 1886,		$2,301,858 66
Total assets December 31, 1885,		1,918.432 05
Increase during the year,		$383,426 61

The liabilities of this company at its last annual report amounted to $1,748,984.44, including the cash capital of $500,000, which deducted from the total assets, leaves a surplus beyond capital of $552,874.22. Now let us take a glance at the receipts and expenditures of this same company as stated by their officers:

Net cash received for premiums,	$1,172,783 32	
Received interest on bonds and mortgages,	26,179 96	
Interest and dividends on investments,	51,503 38	
Income from all other sources,	30,520 47	
Total income received during year,		$1,280,987 13
The expenditures were—		
Net amount for losses,	$635,320 59	
Cash dividends actually paid,	39,747 00	
Paid for commissions or brokerage,	221,971 87	
Paid for salaries, fees and other charges,	155,013 06	
Paid State, National and local taxes,	30,121 27	
All other expenses,	10,108 19	
Total expenses in cash,		1,092,281 98
Income over expenses,		$288,705 15

Now you will observe that the premium income is $1,172,783.32, while the fire losses paid are $635,320.59, so that a greater amount by $537,562.63 was collected in premiums from the insured than what was paid for losses. The income on investments of bonds, mortgages, stocks, etc., amounted in the aggregate to $108,203.81, while the expenditures, other than fire losses, amounted to $458,961.40, nearly as much as the fire losses, and more than four times greater than the income other than premium. Of this last-named item you will observe that $155,013.06 was paid for salaries, fees, clerks and agents, and does not include the item of over $10,000 for office expenses. Again, we notice that $221,971.87 was paid for commissions or brokerage. Mind this does not include the items of about $40,000 dividends to stockholders and $30,000 for taxes, but is paid to a class of individuals very similar to our commercial agents, or drummers, and there are in the State of Pennsylvania about eight hundred of these insurance brokers, and this company alone pays them the enormous amount of nearly $222,000. They are neither officers nor agents of any company, but their business is to negotiate contracts of insurance or re-insurance—in short, they are middlemen, and about one-sixth of all the expenditures of this company goes to these brokers, or more than one-third as much as is paid for fire losses. Nor is this company an exception, for if we review the annual statements of other companies of the State, companies of other States doing business in this State and foreign companies—prominent among which is the Ætna of Hartford, Connecticut, with a paid up capital of $4,000,000; a surplus beyond capital of $4,500,000; total assets of $9,500,000. This company transacts an enormous business in this State, and paid last year dividends to stockholders to the amount of $720,000, which is $314,000 in excess of all the interest and dividends received from investments, $406,000, to brokers alone. In short, the entire expenditures of this company during the year was $2,947,455, and the fire losses paid were $1,429,055. So that running the machinery of the company cost $1,518,400, or $89,345 in excess of the fire losses. This we find is near about a general average of all large companies. The capital stock seems to be a nucleus only, and the business of insurance carried on, not with a desire to protect but for the purpose of gigantic speculation and enormous salaries.

What is the remedy? The only one that I can prescribe is mutual coöperation, especially in country or agricultural districts. I have no data at hand now to prove the fact, but it has been proven that of all the fire losses occurring in the State about seventy-five per cent. thereof are confined to cities and large towns.

It is true, all corporations have established rates largely different for risks on town property and country property, but in no instance sufficiently to correspond with so large an average difference in the ratio of losses. So that in fire insurance, as in most other affairs, the farmer or ruralist has a disproportionate burden to bear.

Now, when we consider the fact that during the year ending December 31st, 1886, the total cash expenditures of all fire insurance companies doing business in the State was $89,908,642.52, of this $52,201,463.62 was paid for losses—not quite 60 per cent. How, then, was the balance of 40 per cent., or $37,707,178.90, expended? We answer, in dividends over $6,000,000, for commissions or brokerage over $15,000,000, for officers' salaries over $6,500,000, and for incidental expenses over $9,000,000. So we see that the ratio of fire losses to other expenses is about as 52 is to 37 or 60 to 40, or in other words it requires an expenditure of $40 to collect $60, and apply it to fire losses. Now, in a well-conducted mutual company, such an outrageous reckoning cannot happen, for there is no capital stock, hence no dividends to pay; no net earnings, therefore, no taxes to pay; no patronage of middle men and no money thrown away for brokerage, and, generally, no excessive salaries paid to officers and agents.

My experience in mutual insurance during the last nine years has been practical, and the local company with which I am connected has been extremly unfortunate, having had to pay for twelve buildings during its nine years of existence, and in my opinion at least one-half of these losses we should not have had. The majority of buildings destroyed were of the inferior kind, and too highly insured. On a few no risk at all should have been taken, while several others I have every reason to believe were intentionally burned in order to secure the insurance money. With all this unusual number and amount of losses incurred, the members of the company have had comparatively cheap insurance. To illustrate, I will present facts taken from the records of the company, one from among the first risks taken. That of one of the charter members, was for $3,200, for which he paid a cash premium of $3.20—ten cents per 100—and gave a premium note of $214, and has since paid four assessments, viz: No. 1, 2%; No. 2, 2½%; No. 3, 1% and No. 4, 1½%—a total of 7% on $214=$14.98 for assessments to which add $3.20 of cash premium=$18 18 total expenses for nine years, or $2.02 per year for $3,200, or 63⅛ cents per 1,000 per year. Very moderate as this has been it should have been 20% or 25% less (reasons for this assertion I will give as I proceed).

Of the total cash expenditures of our company since organization, the ratio of fire losses to other expenditures as eighteen is to one, or 94.5 is to 5.5, or in other words of all the money received by the company, in premiums and assessments only 5.5% thereof has been employed for running the machinery (this includes expenses of collecting four assessments), and 94.5% was devoted to fire losses. Quite a difference between this and the general expenditures of all the companies doing business in the State. From these data, all taken from the last annual report of the Insurance Commissioner, it has been proven that at least, in this one instance, mutual insurance has a great advantage over joint-stock insurance. It is true people have been imposed upon by large mutual companies, principal among which are the old Columbia, the Cumberland Valley, the Perry County and lastly the Lycoming, but the cause of the failure of these companies is largely to be attributed to the mixed business of mutual cash insurance, and of insuring town property without a sufficiently high rate of insurance for that kind of property in comparison with country property.

Not to make this essay too lengthy, I will conclude by expressing my emphatic preference to local mutual insurance companies for farmers, organized by farmers and conducted by farmers. Insuring no town property and vigilantly guard against *sharks* getting into the management thereof. By experience I have learned that the agent or agents of a company should be *members* of the company, and should be selected with the greatest caution and discretion. The man who places a higher estimate upon his application fee than upon the general welfare of the company will ruin a company by taking dangerous risks. The man who lacks judgment as to the value of a building, and at the same time has not the courage to dispute exorbitant estimates, will take risks too high, as people are inclined to estimate their property too highly. Old and dilapidated buildings should not be insured at all, no matter how honest the owner thereof may be, for it is a noteworthy fact our Juniata Mutual has suffered mostly by having old, and in a manner worthless buildings burned that had been insured at twice their real value.

In conclusion, in a local farmers' mutual, the members constitute the company. They know or may know at all times how the funds of the company are applied. They hold their money until it is required to pay a loss and then they have the satisfaction to know that it is applied to the relief of some one who has been unfortunate. They can attend all the elections for officers of the company, and should any become careless or corrupt, replace them by others. In short local mutual coöperaton in fire insurance as well as in many other affairs should be more prominent in agricultural districts.

THE RELATION OF THE PUBLIC SCHOOLS TO THE FARMER.

By HON. JOHN A. WOODWARD, *Howard, Centre County, Pa.*

Any comprehensive consideration of the subject assigned me would seem to require an exhaustive study, not only of the public school, but of the needs of the farmer for such educational equipment as will best qualify him for his special work in life, and the duties of citizenship which devolve upon him, as they devolve upon men of any and every other calling. The limitation of time, which in such a meeting as this is rightfully improved, precludes the possibility of such a study of either branch of the subject, but we will cursorily glance at both, and with your permission I will reverse the order in which I have named them, and just inquire as to the needs of the farmer for education.

In a paper which I had the honor to read at a former meeting of this Board, I presented my own views upon this subject as best I might, but this evening I wish to avail myself of the privilege of quoting from an address of a distinguished ex-president of the New York State Agricultural Society. He said:

"We have all had enough education to incite the desire for more. The important question is, how can we best attain it, and after, how much should we seek?

As upon the amount of education required depends the means for its attainment; let us first consider the desired standard. Shall it be confined to such subjects as are brought into practical use in husbandry? or shall it extend to such as go to the refinement of the mind, tending to elevate the farmer to that social position that he has rarely asserted?

If we were to confine our education to such subjects as have a practical application to our calling, there are few pursuits in life which, if the same rule of instruction were applied, would demand so general an education as that of the farmer. If you except the man who makes literature or science the business of his life, I know of no occupation where what is taught in our higher institutions of learning would find more practical application than with the husbandmen.

All the growth of plants depends upon laws of organic chemistry; how their growth is promoted by manures, by water, air and light. The conversion of milk into butter and cheese; of grain into bread is all traceable to ascertained chemical laws. So that scarcely a law of chemistry, but may have a practical application with the farmer. So of physiology, all the laws governing animal life become practical in the rearing, fattening and improving domestic animals; we may say the whole science of physiology is of practical use.

In geology the character of soils is largely determined by geological formation.

In mathematics, mensuration, surveying land, measuring quantities, taking levels, keeping accounts, and many other ways, makes these studies as important to the farmer as to most other callings.

A knowledge of architecture is important in planning the buildings of the farm in reference to convenience and taste; of mechanics in judging of implements of husbandry, and to protect ourselves against the vender of patent rights.

You look in vain to any other pursuit in life in which scientific knowledge can be so generally employed as in that of managing a farm. Is not this a sufficient reason why farmers should receive as thorough a scientific education as those engaging in any other pursuit?"

I will not permit the intelligent, cultivated, broad-minded man whom I have quoted, nor indeed any other, to go further than myself in his advocacy of that liberal education which fits a man to be at once the best of farmers as the best of citizens. No one better appreciates the more-than-ever-apparent need of this than do I, and no one can work more willingly and cheerfully in its behalf. Upon its importance all thoughtful men may easily agree, and if *the farmer's education* were the subject in hand, we might pass to the question of how it may be attained, without further delay. But the subject assigned me by your Secretary is The Relation of the Public School to the Farmer, and this, of course, limits us to the consideration of the public school as it exists, or should exist, in the country districts. The modifications of it which obtain in large centers of population, need not concern us; the farmer and his family do not have access to them, and I will risk the indignation of the towns and cities by adding that I am glad they do not.

If I rightly understand and appreciate the principle underlying our public school system, it is public education at the public expense for the public good; common culture, at common cost, for common benefit, and that view of the question of the education of the people which regards the individual as the beneficiary of the community, is as erroneous as that of the idler who claims that the world owes him a living. It is true that, so far as the common school goes, the community must and does educate the individual, but it is only that the reflex influence of the individual upon the community may be salutary rather than otherwise. The community no more owes the individual an education upon his own account than it owes him a house, or a farm, or a fortune; but it does owe it to itself to see to it that every member born into it shall be brought to such a degree of enlightenment and cultivation—education, if you please—as will redound to the common weal. The ignorant are vicious, and they must be enlightened as a safeguard to the community. The ignorant are helpless, and they must be made at least self-helpful, that they may not be a burden upon the public, and this must be done at the common cost, where it cannot be done otherwise, because the result is for the common good. Under our form of government every man is a sovereign, and the safety of the State, its very existence, indeed, demands that each shall be capable of an enlightened view and intelligent performance of the duties and exercise of the privileges of citizenship, and because of *this* the duty of maintaining the common school becomes the common duty, and must be done at the common cost. Community of interest requires equality of opportunity, and, therefore, one of the grand foundation stones of the common school system is that "all the children shall have a good, fair, square, even start in life, by the acquirement of the necessary rudimental education." This much accomplished, the function of the public school has been performed, its work is done, and as a factor in the education of the individual it passes into the ranks of the by-gones, as emphatically as does the stimulating smart of the schoolmaster's rod, or the beneficent and resounding whack of his mother's slippers.

I cannot afford to be misunderstood, misconstrued, or misquoted at this point, and let me apologize in advance for attempting, to such an intelligent audience as this, to make more clear and distinct the line between the functions of the public school and that advanced educational equipment which I urge and demand, not only for the children of the farmer, but for those of every other class, creed, division, section, calling or color of mankind. Bear in mind, please, that the duty of the individual to himself, or to his child, in the matter of education, or the advantage and necessity of education is not the matter in hand. "The Relation of the Public School to the Farmer" is the subject; or, in other words, it might be the duty of the whole community, in the matter of education, to that portion of the community which has chosen to pursue a certain vocation as a means to a livelihood. That is the real question, and upon it I take the ground that the community owes to no man, or class of men, as their natural right, one iota of duty which it does not equally owe to every other man or class of men. Therefore, public schools are for public benefit, as distinguished from private benefit, and when a youth's education comes to a point at which it separates itself from the common good, and is to be pursued to a further degree for his individual profit—as a means of his making a livelihood, or advancing his personal interests—the public responsibility ceases. Thereafter he must walk or be carried by some one personally interested in his further progress—the public has carried him as far as it can go.

Am I right in this? Unquestionably, yes; or that apprehension of human rights which makes us always alert to prevent class legislation and class advantages, is wrong. Unquestionably, yes; or the right of the individual to make *any* demand upon the public purse, and the duty of the public to yield to that demand, is conceded.

Then it follows that "The Relation of the Public School to the Farmer" is precisely that which it holds to any and every other man or calling of men. It can be nothing more, it dare be nothing less.

I know that at this point I come in direct contact with a demand which has, of recent years, found expression through some of the farmers' organizations, and in one or two instances, through most reputable farm papers, that agriculture shall be taught in the public schools; but while I entertain the highest respect for those from who this demand comes, and for their motives, I challenge their ability to maintain it upon any principle of right, even if it were not so impracticable as to cast shadows of doubt upon the seriousness of those who suggest it.

The right of a child to a thorough rudimentary education, and the duty of the State to give it, are based upon his needs and those of the

State, and are no more qualified by the line of work he may in after life elect to pursue, or by the occupation of his parents, than by their ability or inability to pay their proportionate share of its cost. The impropriety of the proposition to teach anything in the public schools which cannot be taught with equal advantage to every child in the State, regardless of his present surroundings and circumstances, or his after life work, seems to me so clear that I will not impeach the intelligence of this audience by further attempts to substantiate it.

If, however, the right could be admitted, the impracticability of the scheme stands as an insurmountable barrier. Let me select the single specialty of agriculture for a moment's consideration: Where shall it begin in the public schools? and where shall it end? What shall be taught? and who shall teach it? Let any advocate of the proposition undertake to answer these few simple questions, and he will find himself slipping rapidly away from his untenable position. Why there are more than twelve thousand schools in the rural districts of our own State, and I would like some one to tell me where we could find twelve thousand teachers for them who know enough of agriculture to select and name one in ten of the varieties of grass which grow in the school grounds; or give the life, history and habits of one in ten of the distinctive insects which fly by the school door; or suggest the best and cheapest method of restoring lost fertility to the field upon which the school house windows open. But let me go a step further and see where we will land: If any industry, trade or profession may be of right taught in the public schools, it follows that *all* may be taught with equal right. Do those of us who have families attending the public schools, expect all our sons to follow in the footsteps of their fathers, and become farmers? or every daughter to emulate the heroic virtues of her mother, and become a farmer's wife? Are all the boys and girls born in farming communities, and dependent upon the public schools for their education, to become tillers of the soil? For their own sakes I may wish that it could be so, but it cannot; for we who have the advantages of farm life must of necessity furnish from our magnificent crop of boys and girl recruits for every other industry, trade and profession; and are these to be denied the special training for their work which we would grant to him who is to be the farmer? Certainly not. Then we must provide for their special education. He who is to become a lawyer must be taught law; the doctor must be taught medicine; the preacher theology; the blacksmith to weld iron; the electrician such of the mysteries of his subtle power as he may have stumbled upon, and the shoemaker to drive pegs. Why not? If one be right, then all are right. If one can be done, then all can be done. Now where are your traders to come from? Shall each of the twelve thousand be a walking cyclopedia of all the industries, trades and professions of the earth? Or will we, in accord with the prevailing idea of the age, have a specialist for each; and that constitute each of our twelve thousand country schools a university? To ask these questions is to answer them. Clearly "the relation of the public school to the farmer," is not that of a special educator for his special work—it is not to teach him his business. Just as clearly it is precisely the same relation it holds to men and women, and their children, of any and every other class, kind or calling.

A committee of the National Council of Education has defined this as follows:

"The function of the common school is to develop more perfect manhood and womanhood by educating children through instruction in that secular knowledge which in a civilized community is indispensable to the individual, and through the guidance and discipline incidental to such instruction."

This is general, and the limitations of my subject as well as of time, forbid me to generalize, but if my position be correct, this statement of the function of the public school defines perfectly its relation to the farmer. It might be expressed in another, though perhaps less comprehensive form, by saying that its function is to give thorough and complete instruction in the rudiments to every child within its province. That our public schools do not, as a rule, in either the farming districts or the towns, perform this duty in that proper and thorough manner which would best accomplish the purpose of their creation and maintenance, goes without saying. In the pursuit of my work in connection with farm journalism, a very large mass of correspondence from farmers comes constantly into my hands; and while it gives evidence of thought, and brain-power, and culture beyond that which could probably be found in an equal number of letters from any other class of men, excepting, perhaps, those who have given their lives over to the pursuits of scholarship, the failure of the public school to properly perform its true work of rudimentary education, is painfully apparent. No matter how the 'ologies and the 'osophies may flourish, thorough work in the basic studies is almost universally neglected, and this is the strong point in the school education of the farmer. What he needs of the schools more than he needs anything else is such a fixing and grounding in the rudiments—"the three R's," if you will allow me to quote the old Irish schoolmaster—as will constitute for him a complete equipment, whereby he may, in his post-school days, acquire his real education. Indeed I do not know but my idea of the true work of the public school is expressed in that thought, viz: to provide the youth with implements by the diligent use of which he may acquire an education. The better the character of these implements, the better is its work accomplished. The neglect of thoroughness in this work is the crying evil of our public schools.

To this lack of thoroughness, its causes and its remedies, I desire to call your attention for the very few moments which I may yet occupy. I need not stop to show the fact, it is admitted by all careful observers. Is not its cause to be found in our own failure to appreciate its importance, and our consequent neglect, and is not the remedy in our own hands? I am a farmer, living on a farm, in a decidedly country district, and when I use the first person plural I purposely include myself in whatever accusation attaches to my answer—yes. We do not pay school tax enough, we do not pay it cheerfully enough, and, more than all, we do not interest ourselves enough in the proper or improper application that is made of it by those entrusted with this duty. It is true that our public schools are the creatures of State laws, and are conducted upon lines that are lain down for them by State authorities; but it is equally true that under these State laws, and notwithstanding the red tape limitations of lines laid down by State authorities, we make them just what we would have them. The schools of a district are a faithful reflection of the character, and index to the intelligence of its citzens. If they send our youth out into the world with but a coarse, crude smattering of that fundamental knowledge that lies at the very base of all intelligence, education and culture, unprovided with the means of acquirement of knowledge, and unarmed for the battles of life, it is because of our neglect or wrongdoing. We permit personal, political or other unworthy reasons to influence us in our choice of school officers. We permit perverse and ignorant men to attain to these positions, forgetting that we thus place in their hands the control of the most important part of the education of our children. They, for reasons similar to those which controlled us in electing them, or for other and worse ones, select careless, thoughtless, incompetent teachers, whose chief object in seeking the place is to avoid hard work, and get a comfortable berth by the stove during the winter. In order to secure this, and recognizing his own incapacity and unfitness for the work, they are willing to accept less wages than we would be compelled to pay for digging ditches or loading manure—work for which they are, in far too many cases, the better fitted. Or, worse yet, we permit the question of taxation to govern us in all that we do in the direction of the schools, and stipulate only that the teacher for our district shall not be paid more than fifteen dollars per month, and measure the qualifications of a school director by the number of mills which he can knock off from last year's tax duplicate. True, this is not always the case. Here and there communities there be whose enlightenment leads them to an appreciation of "that secular knowledge which in a civilized community is indispensable to the individual," and prompts them to a proper performance of their duties in this direction to their children and themselves.

Let us each set ourselves to the task of bringing our own community up to this standard. Preaching cannot bring it about. Individual scholarship cannot reach it. Legislation cannot effect it. The compulsory school term may be lengthened until months will have to be added to the year to accommodate it, and we will be as far as ever from the desired result. All the isms, and all osophies, and all the ologies in all the curriculums of all the universities may by statute be added to the list of studies, and the blot of incompetency and incompetence and incompleteness still remains. Every crank in the universe may ride his hobby right into the public school room, and tether it to the teacher's desk, and that grounding of our youth in the rudiments which constitutes a firm foundation for a successful life will be but farther away from us. The need of the hour in the public school is thoroughness in the rudiments, not futile attempts at the specialties, nor smattering in the ologies; and there, as well as on the farm, the true doctrine is intensity—not expansion.

"Agriculture in the public schools," indeed! In the name of universal culture, and of all right and propriety, let us see to it that the legitimate functions of the schools are properly performed, before we attempt that which should not and cannot be done. Thorough rudimentary education for all is the dictate of justice and right. No class division of money that comes out of the general pocket. Let the farmers take the schools of their districts under their special care, and see to it that each child within its reach goes out from it grounded and fixed in those essentials which are the common right and common need of all, and then, and not until then, will we have established the true relations of the public school to the farmer.

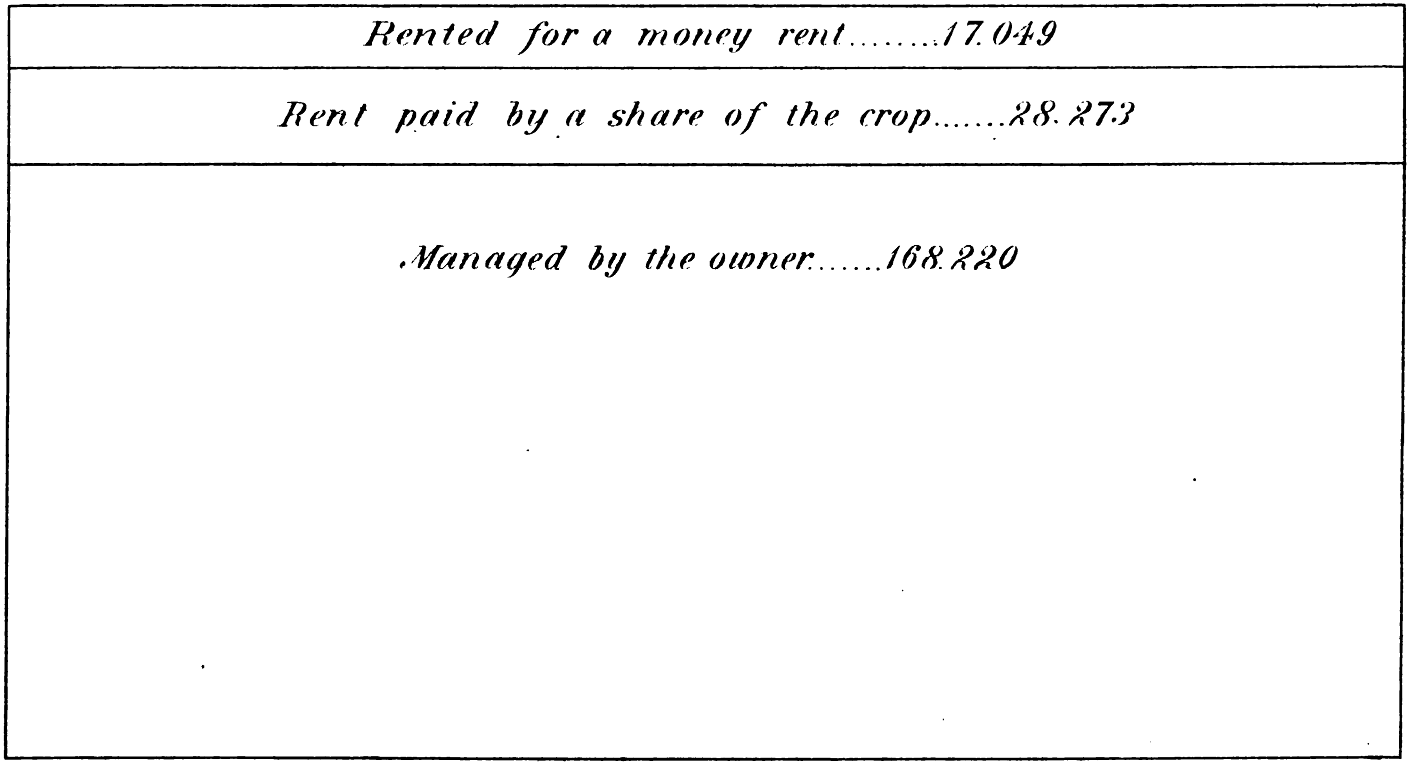
HOW CAN WE IMPROVE OUR COMMON SCHOOLS IN THE RURAL DISTRICTS?

By Prof. A. H. BERLIN, *Montrose, Pa.*

Washington says: "Promote as an object of primary importance, institutions for the general diffusion of knowledge. In proportion as the structure of a government gives force to public opinion, it should be enlightened." There is a radical difference between the ancient and modern ideas of the existence of the individual. In the ancient empires the individual "lived, moved, and had his being" for the benefit of the ruler or the state. The monarch ruled by divine right, and the blood of millions was freely poured out to cement the foundation of his throne. There, however, came a time when the bloody march of this demon of irresponsible power ceased. It reached its culmination in the reign of Louis XIV., upon the ceiling of whose magnificent palace at Versailles you can read his motto: "The state: it is myself." Strife and carnage oft repeated finally taught the world a different lesson, and prepared the way for the charter of our own freedom and for that consummate Constitution which begins "We the people"; and the celebration of whose century of existence, with so much patriotic fervor and rejoicing, emphasizes the idea that the individual occupies a place of responsibility.

The most cursory glance at the present condition of the enlightened nations of the globe affords a most emphatic suggestion of the radical difference between the ancient and the modern philosophy. The great burden of ancient philosophy was speculation—of modern, utility. Macaulay says: "Words, mere words, had been all the fruit of all the toil of all the most renowned sages of sixty generations." A recent writer says: "This is a grave charge and needs to be substantiated," which he does by quoting from the writings of the ancient philosophers. Seneca refers to inventions in his time, such as transparent windows, short-hand writing, and tubes for diffusing heat; but adds, "The invention of such things is drudgery for the lowest slave. It is not the office of philosophy to teach men how to use their hands." Plato's majestic intellect was dominated by the same spirit. He remonstrated with his friend Archytus, who had applied his mathematical skill to the construction of machines of great power, for degrading a noble intellectual exercise into a low craft fit only for carpenters. It is difficult to comprehend the transition from an age in which its wisest men condemned the exercise of the intellectual powers for humanity's sake, to one in which the profoundest students of nature and mind vie with each other in inventions for the benefit and amelioration of the masses.

The common school must then of a necessity play an important part in the preparation of the individual for the performance of those duties which his elevation into the full light of responsibility as a member of society and the state demands. It is true that the system aims to realize the greatest possibilities in those who drink at its fountains. It is built up to educate them for fields of usefulness, at the expense of money, labor and sacrifices, to the members of the community; but freely made, because all recognize, by their experience, the value and importance of the equipment which can thus be secured. History tells us of the great power of education. How Athens with her



MANAGMENT OF FARMS IN PENNSYLVANIA.

Total number of farms in Pennsylvania........213. 542

arts and sciences, Rome with her learning, long occupied the most exalted positions among the nations of the earth! The nations of intelligence and education have been the powerful nations in ancient and modern times. Money is a great power, a great necessity, but education is money and more. When a nation needs men, she calls upon her educated men, not upon her Vanderbilts and Goulds. What then can be nobler than that which has for its object the building up of manhood; the restoration of, "not of a few fallen temples, or classic marbles, or frescoes, but the defaced and fallen architecture of the human soul." It is verily a source of regret when the fullest fruition does not follow the planting of the seed, when the organization of schools do not bring results in its train to incite men "to live for high action, aims and purpose, comporting with and dignified by truth."

There is no question which should secure a more thoughtful and earnest attention than this; because education is not a matter of chance. It is an orderly development of man's powers that furnishes his mind with knowledge, and gives him skill to use it. It is, therefore, a matter within our control. When a community has poor schools, it has only itself to blame. Proper soil, heat, moisture and light a plant must have or it dies. It is truly said "that plant-life symbolizes human growth and culture; yet the educational life of the child as far transcends that of the mere plant as human intelligence rises in grandeur above the life-principles imbedded in the kernel of grain." The highest interpretation is the perfection of the individual for the duties of life.

Do our rural schools fail in furnishing our pupils with these two things, the object of any school organization:

First. With those equipments which prepare them to become *bread-winners* in the race of life. *Second.* With the key that unlocks the door of the temple of knowledge so that its treasures may prove a *bread-sweetener*.

The charge is made, with no uncertain sound, by thinking men and women, who have the good of the individual and of society at heart, that while our town and city schools are growing better, our rural schools fail to advance, but on the other hand grow poorer; that they do not perform their function in the economy of education, either in preparing our boys for the farm, the shop, or the office; or our girls for the stations which may fall to their lot to fill, or give culture to the popular taste, so that the eye may see the beauties of heaven and the ear hear sweetness of music. "The earth teems with a thousand times as many arrangements for beauty as for any minor utility, and its Maker declares that 'men shall not live by bread alone.'" No nation can rise to its highest possibilities of noble and happy living without the culture of the popular taste in addition to the fitting of the individual for the practical duties of life. We have arrived at a point in our history when we must look higher and farther, if we would render permanent this temple of ours and adorn its goodly walls. To neglect to make our rural schools models and an essential part of our national growth, is to deprive a large class of people who, in all lands, are looked upon as the bone and sinew of the government, of that which is their birth-right.

There are some changes necessary in order to bring about a better condition of things, and I would suggest the following as some of these essential changes:

First, a readjustment of our school curriculum. Simon Tappertitt, one of Mr. Dickens' characters, prided himself upon his ability to "to eye things over." This is just the ability we want to develop in our boys and girls during their scholastic training—the ability to "eye things over." I plead for a broader sweep in our courses of study. Tubbock says, "Too much concentration is a great mistake in early life." Do not confine the child to a few humdrum ideas only. We must take for granted that the child has some brains—some knowledge gained during the years when its mother was its truest and best teacher. We must begin where she leaves off, and move on in an ever widening circle. We must also aim to continue the spell of enchantment which surrounds it, when it enters the new realm of unexplored wealth of beauty. It happens, however, too frequently that so few new ideas are presented, so narrow is the road it must travel, and so high the walls inclosing it, that it soon losses interest. The machine begins to grind its required amount of mental pabulum. By and by the child ceases to grind, at all, then we modern teachers bring forward our methods of carrying-along-pupils without work in order to give parents the impression that the child is a prodigy of mental discipline and acquirement. Children are by nature eager for information. They are always asking questions. This ought to be encouraged. In fact we may to a great extent trust to their instincts, in that case they will do much to educate themselves. Tubbock in a recent essay truly says, "too often the acquirements of knowledge is placed before them in a form so irksome and fatiguing so that all desire for knowledge and information is choked or crushed out, so that our schools, in fact, become places for discouragement of learning and thus produce the very opposite effect from that at which they aimed. In short children should be trained to observe and to think, for in that way there would be opened out to them, a source of the purest enjoyment for leisure hours, and the wisest judgment in the work of life." Milton even, in his day, complained, "that our children are forced to stick unreasonably in these grammatick flats and shallows." Our prayer may well be that of the good brother, who prayed for his minister that he might be given spiritual and especially mental strength, "for, O Lord, thou knowest how long we have been fed from an empty spoon."

We are running wild on arithmetic, and yet few children can readily do the every day useful parts of the text-book. With all this drill we neglect to furnish them the equipment, which farm, shop, or counter demands from them. Arithmetic is a delightful study, and it has two main objects; first, accuracy; second, rapidity. Are these objects secured in a majority of our schools? Relegate technical grammar to its proper place, which is in an advanced course of study. Of what profit is it to a child to be able to parse and "to hang upon hooks" the most difficult sentence in the language, if it cannot properly pronounce the words in it; if it cannot compose, spell, and punctuate a letter or write a note, a receipt, a bill, or a brief article for the public print. It is of little value to be able to call words rapidly and correctly and not know nor appreciate the sense and sentiment of what is read; yet this is the very condition in which too many of our children are to-day. I would have reading well taught; for it is the golden key which unlocks the temple of knowledge.

It may be of interest to note some of the things which an eminent English authority is of the opinion a boy or girl of fourteen might reasonably be expected to know, and differs very little from the curriculum of a German common school. A pupil of this age should be expected to "read aloud clearly and agreeably, to write a large distinct hand, and to know the ordinary rules of arithmetic; to have a thoroughly good elementary knowledge of geography, under which are comprehended some notions of astronomy—enough to excite his curiosity; a knowledge of the very broadest facts of geology and history—enough to make him understand, in a clear, but perfectly general way, how the larger features of the world he lives in, physical and political, came to be like what they are; to have been trained from earliest infancy to use his powers of observation on plants, or animals, or rocks, or other natural objects; and to have gathered a general acquaintance with what is most supremely good in that position of the more important English classics which is suitabla to his time of life; to have some rudimentary acquaintance with drawing and music." How fearful is the waste of time and energy in our schools! "Try to know," as Lord Brougham has well said, "everything of something, and something of everything."

Second, reduce the number of schools. Right here is the trouble. There are altogether too many schools, and the number is still constantly increasing. Is it not a mistake, farmers? Do we not reason in this wise on this subject? "Now, there is Mr. A., his children have only a few rods to go before they arrive at the school-house door, while mine, just as good, have a mile or more to go before they reach the school-house. This is not right. There are a number of children in this neighborhood, similarly situated; and I shall get up a petition for the building of a new school." You succeed by agitation and persistent drumming. But, have you after all been wise? Yes; penny-wise but pound foolish! Does the decrease in distance out-weigh the incentive of a proper number of pupils, the increase in expenditure, and the poorer quality of training received?

I take it as an established fact, beyond controversy, that numbers increase interest. No competitor in the strife, be it in the Olympic games, or in the prosecution of one's studies in the little red school-house on the hill, must necessarily, in nine cases out of ten, lead to the surrender of one's ambition. Permit me to illustrate this thought still further by quoting from actual experience. School No. 1 was the pride of the west end. It consisted of about seventy-five studious lads and lasses, who excelled in their studies as well as in the various sports incidental to such a school. The emulation engendered there by honorable rivalry and competition left its ineffaceable imprint on on the minds of its pupils. Leaving the school they possessed, as the result of good training, a desire to continue their studies in higher institutions of learning. What has become of this model school? The building of two or three additional school-houses in the same district has left this once prosperous school a stranded wreck on the shore of a mistaken policy. Instead of being a position eagerly sought after, the people must now accept what comes.

We put our stock not into fields that afford no grazing, because they are close by and it saves walking. We prefer to drive them a little farther where there is something to eat. Would it not be a thousand times better for farmers to make some provision for carrying, in turn, the children to the school from the more distant points in the district? The child learns to toss its thoughts more easily; he marshalls them more orderly; he sees how they look when they are turned into words; finally, he waxes wiser, and that more by an hour's intercourse than by a day's meditation in an empty school-house, even if it is at your door.

I present the following table to show the condition of our own county in this respect, and to emphasize another evil, that of too frequent change of teachers. These too—too many schools and a constant change in the teaching force—should receive your earnest attention, and a remedy should be found right speedily; for they militate against any advance in educational advantages furnished by our district schools.

DISTRICTS.	Number of schools.	Number of teachers employed during the year.	Number of scholars enrolled.	Average attendance.	Average per school.
Rush,	14	28	298	182	13
Auburn,	17	33	531	340	20
Jackson,	10	21	388	269	27—
Lenox,	14	28	391	255	18+
Bridgewater,	15	23	317	212	14+
Dimock,	11	22	243	155	14+
Lathrop,	7	14	140	112	16
New Milford,	16	23	333	240	15

This table speaks for itself. It shows in a startling manner the waste of time, labor, money and teaching power. Rush, with its fourteen schools, two terms per annum, employed twenty-eight teachers. Jackson did still better by employing twenty-one teachers for its ten schools, in one year. Shades of Horace Mann! How can we expect good intellectual crops under such pedagogical tillage? We are not so foolish as to expect a colt, having a number of trainers endowed with different temperaments, and employing different systems of training, to become a useful and valuable animal.

One term ended, says a friend of mine, the instructor "folds his tent like the Arab," and departs for "green fields and pastures new." He walks into a new school-room the first morning, endowed with all those charms which the new teachers always possess. Curious eyes watch every move, and listening ears soon hear the words, "Begin on the first page and take two pages." They knew that it was coming; they had heard, again and again, those ominous and discouraging words. So, perhaps, they go over and over the same ground, until, from more force of habit, they can set their tongue agoing and repeat whole pages of words and mere words, no thought. This is an incidental evil, but who can estimate its blighting influence.

In this swapping of so many jack-knives some one must get the broken-bladed knife. It is the innocent pupil every time.

Third. *A change in the organization of the schools.* Readjust the course of study, reduce the number of schools which will increase the salaries and thus improve the quality of the work done, and, lastly, grade the schools. Is it a mere idle dream of the brain that the schools of a township can be graded? What is there in the way to hinder in arranging a primary school course, a grammar school course, and a high school course? It is not necessary that each school in a township should teach precisely the same grades, although such grades consist of only one or two pupils each. Some arrangement can be made which will bring together a sufficient number of pupils of similar proficiency for instruction by one or more teachers. Then provide the still greater incentive of a county high or normal school, situated at the county seat, and you will hear less and less of the inefficiency as well as insufficiency of our rural schools. It is, however, not within my present purpose to discuss the organization and scope of such scholars; that can be safely left until the time of its realization. Reforms move slowly, and it will require "line upon line, precept upon precept," before any material progress is made in this direction, but it will come sooner or later. Then the pupils of our ungraded schools will have the same educational privileges which their more fortunate cousins of the town and city possess in this respect at least.

Let us find inspiration to do our duty towards the rising generations in the noble words of Epictetus, "you will do the greatest service to the state if you shall raise, not the roofs of the houses, but the soul of the citizens; for it is better that great souls should dwell in small houses rather than for mean slaves to lurk in great houses."

POULTRY AS A SOURCE OF PROFIT ON THE FARM.

By E. Reeder, *Member from Bucks, New Hope, Pa.*

The poultry crop of the country has never been considered of sufficient importance to be published in the census report, but at the taking of the tenth census (1880), the poultry of Pennsylvania were enumerated but not published in the compendium. I have obtained from the acting superintendent of the census, a statement showing the statistics of poultry and eggs, of the State of Pennsylvania, by counties, according to the census of 1880. The values of these farm products were not inquired after by the enumerators.

The statistics of poultry comprise the stock on hand June 1, 1880, exclusive of spring hatching; the eggs were the product of the year 1879. The total number of barn yard fowls in the State was 6,734,479; other poultry, 740,787. The total number of eggs produced in the year 1879, was 34,377,889 dozens. If now we place values upon these figures, counting the poultry at fifty cents a head, and the eggs at twenty cents a dozen, we have the value of the poultry, $3,737,633 and $6,875,577.80 cents, as the value of the eggs; making a total of $10,613,321.80. From this it will be seen that the poultry crop takes a high rank among the farm products of the State."

"The profits arising from this crop, depends mainly, as do the profits upon all other crops.—First, upon the cost of production, and, second, upon the quality produced and the price received for it. Under ordinary circumstances and management, a profit of fifty cents. for each hen, may be stated as a fair average. Our own experience about corresponds with this statement. 100 hens kept, the sales of eggs for the year were $100, and the sales of poultry $100, keeping enough young stock over to replenish the original stock. If the cost of keeping amounts to $1.50 per head, this leaves a profit of fifty cents a head for each hen kept. Poultry fanciers do much better than this, while others do not do as well. We have often heard the remark among farmers that the "poultry eat their heads off," thereby implying that they cost more than they come to, and therefore no profit, but on the other hand a loss, in the keeping of this stock."

"In the consideration of this question there are several vital points that must be settled:—

1. What does it cost to keep a hen a year?
2. How many eggs will she lay in a year?
3. How many fowls can be raised in a year per hen, in flocks of stated sizes?
4. Does the profit consist in selling the eggs, or in raising the chickens?

In trying to settle these points I have consulted different authorities. Dr. Dickie, poultry editor of the *Farm Journal*, recently gave us the following statement of what a single hen should do when kept solely for egg production, viz., twelve dozen of eggs at sixteen cents per dozen $1.92. Cost of keeping per annum $1.50, leaving a profit of forty-two cents per hen. We consider the number of eggs laid as *above*, and the price received as *below* an average in this statement.

The Thompson brothers, of the Aquetong trout farm, who have recently added poultry keeping to their other business, have very kindly furnished us the following figures:

In an accurate account kept last year the following results were obtained:

1. *The Cost of Keeping.* The average chicken will not eat more than four ounces of grain per day. This makes ninety-two pounds in a year, a little over a bushel and a half of wheat or corn. If we reckon this at $1.00 per bushel, it makes the cost for grain $1.50. In addition to this feed of grain some green food was added, upon which no value was placed.

2. *Egg Production.* It is only the very best laying breeds, the White and Brown Leghorns, that can be made to produce twelve dozens, or 144 eggs in a year.

Nine White Leghorn hens kept in a house six feet by nine feet, with a yard six feet by sixteen feet, laid 1,290 eggs in one year, which is very nearly twelve dozen eggs for each hen. Six White Brahma hens laid 697 eggs, which is an average of 116 eggs, or nine and two-thirds dozen per hen.

Fifteen common hens laid 1,322 eggs in one year, which is an average of eighty-eight eggs or seven and one-third dozen per hen. Another flock of thirty-one hens laid 3,101 eggs, which is an average of 100 eggs, or eight and one-third dozen per hen.

3. *Selling Eggs and Raising Chickens Combined.* Last year the results obtained from this flock of fourteen hens were as follows: Total number of eggs laid, 1,322; eggs set, 237; chickens raised, 156; loss, eighty-one eggs; sold 1,085 eggs, 334½ pounds of chickens, and kept thirty-three chickens, in all amounting to $79.09, cost of feed $19.00, leaving a profit of $60, or four dollars per hen.

Results obtained from the flock of thirty-one hens, 3,101 eggs. Chickens and eggs sold $102.54, with 104 chickens carried over worth $52, making a total of $154.54 for receipts. Cost of keeping, including young stock raised, $78.39, leaving for profit $76.15, or very nearly $2.50 per hen.

4. *Greatest Profits from Raising Chickens and Selling Eggs Combined.* From the foregoing statements it will appear that there is not very much profit in keeping chickens for the eggs alone. It is too much like keeping sheep for the wool, or cows for the value of the calves for veal. We must combine chicken raising with egg production, just as we do lamb raising with wool growing, or milk and butter production with calf raising, if we would secure the greatest profits. These statements of profits given are not imaginary, nor speculative, but actual. Neither do they represent the highest profits possible to be obtained. The Thompson Brothers have no difficulty in making spring chickens weigh one pound each at five weeks old, and one and one-half pounds each at eight weeks old. These, at forty cents a pound are worth sixty cents a piece. If, therefore, the hen only lays one dozen eggs, hatches and raises ten chickens, she realizes a profit to her owner of $5.00 in a period of three months.

The apparent discrepancy in the cost of keeping between the lots of fifteen and thirty-one hens is accounted for by the Thompson Brothers thus: First, the lot of fifteen ran out and obtained part of their food by foraging, while the lot of thirty-one were kept confined. Second, the chickens raised from the lot of fifteen were sold early, while those raised from the lot of thirty-one were kept over winter. Third, the feed bought for the lot of fifteen was purchased in New York by the ton, at wholesale prices, while that for the lot of thirty-one was purchased at retail from mills in the vicinity.

In referring to the use of incubators, Mr. Reeder writes as follows: "About seventy per cent of the eggs are hatched. The proper temperature to be maintained ranges from 101° to 105°. This temperature is first secured by coal oil lamps, and then regulated and maintained by electrical or galvanic batteries. When the incubator becomes too warm, or 105°, a spring is touched which opens a valve; when the temperature falls to 101, another spring closes the valve. Every few moments the valve is opened and closed with a clicking noise. The chickens when hatched are placed in an artificial brooder, which consists of a box of sand about five feet square. Across the center of this box is a board about two feet wide, upon the underside of which is tacked the pieces of carpet, cloths, &c., to take the place of the feathers of the hen. The sand in the box is kept warm by a coal oil lamp underneath. Upon each side of the box lids made of glazed sash, which can be raised at pleasure. In pleasant weather the young chicks are permitted to run out when a few days old. In this way they are kept healthy, free from vermin, and made to attain the weights already given at the respective ages.

INVESTIGATION OF DISEASES OF LIVE STOCK.

From the annual report of the Secretary.

By the provisions of the act of May 8, 1876, the Board of Agriculture is given supervision over sundry agricultural interests, and among them that of a general supervision of the health of the live stock of the State; by subsequent acts the Legislature made it the duty of the Board "to investigate diseases of live stock in the State" and by annual appropriations provided for the payment of the expenses of the work; by the act of June 2, 1887, in addition to the duty of investigation (which is continued) the Legislature added that of "preventing the spread of disease among domestic animals (not otherwise provided for)" the act of May 1, 1879, having provided for the suppression of contagious pleuro-pneumonia and placed the work under the care of the Governor, the above exception was made so that there should be no division of duty or responsibility.

For the purpose of carrying the act of June 2, 1887, into effect and for paying the expenses of work under its provisions, the Legislature made a specific appropriation of five hundred dollars per annum; when devoted to the care of $86,000,000 worth of live stock, this sum was found to be inadequate and the work of the Board, so far as preventing the spread of disease is concerned, was necessarily limited to the more prominent and most dangerous outbreaks; the amount was divided into four equal parts and one reserved for each quarter of the year; in this way the Board was in the posession of a reserve fund for special cases.

Under all previous acts, the Board had been left free to investigate any disease to which the attention of its officers might be called, and which appeared to be of sufficient *general importance* to warrant the expenditure; the act of June 2, 1887, by its phraseology, appeared to limit the investigation to disease of a contagious character; language being "preventing the spread of disease among domestic animals (not otherwise provided for) and for investigating the same"; it was decided that under this change in the wording of the act, the work of the Board was limited to contagious disease; this decision, in a number of cases, caused a misunderstanding between the stock owners of the State and the officers of the Board; under previous acts, numerous diseases, not contagious, had been carefully examined and remedies prescribed; thus many of the stock owners of the State had arrived at the conclusion that it was the duty of the secretary to order an investigation and to send a veterinary surgeon whenever so requested; the above decision (based on the obvious intent of the Legislature) prevented this and hence in several cases the failure of the Board to send its surgeon for investigation, was misunderstood and unfavorably commented on. It should therefore be distinctly understood that the Board is under no obligations to send a surgeon unless there is good cause to believe that the disease is of a contagious character and likely to spread among neighboring live stock; in any event it must be obvious to all that the amount appropriated is inadequate for a proper investigation of even contagious diseases.

Owing to the action of the Board in thus investigating disease of live stock, many owners of animals have assumed that there is a State Veterinary Surgeon drawing an annual salary from the State and that he is at all times ready to answer any call that may be made for his services; such is not the case; when the Board needs the services of a veterinary surgeon, one is employed for the special job, just as would be done by a private individual; if such a surgeon resides in the neighborhood, he is employed, and the Board has in different portions of the State several surgeons whose services are thus called into requisition, but no one is paid an annual salary for such work; the amount of the annual appropriation (five hundred dollars) would preclude such a plan even were it desirable.

In all cases where an examination is asked for, care is first taken to obtain all possible information by correspondence or by detailing the nearest member of the Board to make a preliminary examination and report; in this way the funds at our disposal have been economically expended and we have been enabled to accomplish much more good, than if expenditures were at once made in all cases reported.

The provisions of the act limiting the work to strictly contagious disease, of course placed Texan or spleenic fever beyond our reach, but recognizing the fact that while not contagious in the northern or western animal, this disease is contagious from the system of the southern animal, we, in a number of cases, carried the investigation far enough to prove that the animals infected were not of southern origin, and there the investigation was stopped; this has in some cases resulted in a misunderstanding of the duties and motives of the officers of the Board and in several instances they have been charged with a neglect of duty, in not fully investigating and providing for such cases; it is to be regretted that the limited amount of the appropriation compels a course which is liable to be misunderstood but the plain duty, as it is interpreted by the officers of the Board, compel us to use proper discretion in prosecuting the work.

As has been the case in previous years, a large number of cases of tuberculosis have been reported and investigations asked for; the wide extent to which this disease prevails and the limited amount at our disposal has effectually prevented any attempt to take action or prevent its further spread; the killing of the few animals which our appropriation would enable us to pay for, would accomplish little or no good and would cripple us for other work, and such action would have the appearance of favoritism; there can be no doubt that this disease is spreading rapidly, and that unless something definite in the line of prevention is adopted, it will in the near future be more dreaded by our stock owners than was contagious pleuro-pneumonia. The extent to which the disease prevails would lead to the suggestion that it, like contagious pleuro-pneumonia, should receive the combined attention of State and national authorities, for it is of little practical benefit that one State shall expend its funds in the suppression of a disease which can at any time be imported from a neighboring State.

In the following pages, we present, in a condensed form, an outline of some of the results of the work of suppressing and investigating contagious disease, and in so doing we feel satisfied that no similar amount expended under the patronage of the State has contributed more for the benefit of the class for which it was given, than has this fund of five hundred dollars.

The limited space at our command prohibits the insertion of any but the more prominent cases investigated or acted upon, and it should be distinctly understood that the cases which are here stated are not to be charged with the full amount of the annual appropriation, much of it having been expended in the investigation of others not here reported. A portion of it was also unavoidably consumed in the investigation of cases which, after a partial examination, were found not to come within the provisions of the act of 1887, although clearly covered by former acts.

One of the leading points brought out by the year's work in this department of our duty, was that of the liability of the State for animals killed in order to prevent the spread of a contagious or infectious disease. On this point the Board has few precedents upon which to establish a line of action. The act for the suppression of contagious pleuro-pneumonia, while it plainly provides that animals may be killed does not provide specifically for any payment for them. In an extended outbreak of glanders (specifically reported elsewhere) it became necessary, in order to limit the spread of the disease, to kill a number of the infected animals; this at once brought up the question of the liability of the State for animals killed for the public good. After consultation with the Attorney General, it was decided that it was absolutely necessary to kill the animals to prevent the further spread of the disease, for their isolation could not be depended upon, and that the right to kill carried with it the duty to in some way recompense the owners. Certificates of value were issued with the distinct understanding that the officers of the Board assumed no responsibility for heir payment by an appropriation.

In carrying into effect the act of May 1, 1879, for the suppression of contagious pleuro-pneumonia, the same condition was met with, and for several years all animals killed under proper restrictions were paid for by the State. In this case this line of action has been satisfactory to the owners and to the officer representing the State, and it is to it that we may largely attribute our success in dealing with this disease. We think it safe to assume as a rule that any attempt to stamp out contagious disease must have as an essential element the coöperation of the owner of the diseased stock. Any other course will lead to the disease being concealed, and its further spread will be thus encouraged and fostered. The experience of nine years with contagious pleuro-pneumonia clearly shows this expenditure to have been economical, inasmuch as it caused owners to promptly report all suspected cases.

Admitting the duty and responsibility of the State for individual property taken for this purpose, it follows that the manner of appraisement and payment should be limited by a specific enactment of the Legislature. The decisions of the Attorney General were no doubt, under the surrounding circumstances, sufficient to warrant the Board in, theoretically at least, exceeding its appropriation, but the work could be much more satisfactorily accomplished under a distinct and special act, which should provide not only the means for payment, but also the proportion of value to be paid, and the manner at which the value shall be ascertained, and we think it advisable that the coming session of the Legislature should not be allowed to pass without securing some specific legislation providing for the suppression of contagious diseases among live stock. Such an act should contain a provision authorizing the Board of Agriculture, with the consent of the Governor, to accept the coöperation and assistance of the National Government in this work.

Paturient Apoplexy (Milk Fever).

From some cause not readily explained, the number of cases of paturient apoplexy has been greater than usual during the past year, and the proportion of animals lost, when compared with the number attacked, has also been larger. Many theories have been advanced for the exhibition of this disease at the critical period at which it is always noticed, and after consulting numerous standard authorities, we find nothing which, to our mind, better accounts for it in a few words than the following quotation from Finlay Dun, who writes thns in explanation of the cause which operate to produce the disease.

"The large quantities of blood that has, until the time of paturition, been nourishing the calf, are not diverted into their new channels for the production of milk. If, at this critical period, the bowels are constipated and the udder does not at once take on its functions, this superabundance of blood soon becomes a source of mischief."

This, we think, may be safely accepted as *the cause* of paturient apoplexy, and however we may differ upon the non-essential points of after results and veterinary practice, we think that all will admit the correctness of this quotation from Dr. Dun. Admitting this it is evident that all treatment should be directed to the removal of the causes, and that in this disease the truth of the old adage that "an ounce of prevention is worth a pound of cure" is strikingly correct.

In our dairy experience we have never had a case of milk fever which was not preceded by constipation, and we have never had a a case where care had been taken to prevent the occurrence of this trouble.

As a further proof of the correctness of the theory advanced by Dr. Dun, we have the fact that milk fever is not usually to be found after cases in which paturition has been difficult or delayed, and is usually met with in cases in which paturition has been rapid and apparently painless.

The reason is evident; in the case of delayed paturition the surplus blood is not diverted from the old into the new channels all at once, but gradually assumes its new functions without serious disturbance in the system of the animal; on the other hand in all cases of rapid paturition the supply of blood which had before gone to the offspring is at once forced into a new channel and into new organs; this fact has probably caused the prevalent idea that certain families of cows are more liable to this disease than others.

J. W. Hill, in alluding to this disease, writes as follows: Firstly, Then what are the predisposing causes of this disease? I have already observed that cold, breed and condition play their part in its production. And to these may be added inattention to the bowels; this is an important matter, for if constipation is present at the time of paturition, and is not immediately overcome, the worst results, in case the animal is attacked with paturient apoplexy, ensues, for it cannot have failed to strike every one who has had any experience in cattle practice, that constipation in the cow, especially in this disease, is but with the greatest difficulty removed, and in very many instances our patient succumbs to the disease without medicine having taken the slightest effect, obstinate constipation remaining to the last, though drugs enough to operate on a dozen animals may have been given. Indeed in many instances constipation is an exciting cause of paturient apoplexy.

Dairymen who have for some time been accustomed to the care of cows have noticed that this disease is seldom if ever noticeable until the birth of the third or fourth calf; one of our most noted surgeons states that he never knew of but one case of its occurrence before the third calf, and that the majority of his cases were with the third calf. Dr. Hill accounts for this by the following reasoning, which is at least plausible if not convincing: "It is probably because the vascular system is not replete, and the lacteal secretion is not so great at the two first births as at the third and fourth." Dr. Hill further states that after the birth of the third or fourth calf the danger from attacks diminishes with the age of the animal and the number of calves.

Among the many exciting causes, which, in connection with constipation, produce the disease, we may give the following:

1. A sudden increase in the amount and quality of food; the dairyman is naturally anxious to produce the largest possible amount of milk, and by extra food forces the animal and thus increases the very evil which he should avoid.

2. The removal of the calf immediately after birth, by which the regular emptying of the udder is prevented, and the action of the calf in sucking, which promotes the lacteal flow is lost, and by preventing an increased flow of milk, causes the difficulty to which we have before alluded, that of an improper diversion of the extra blood into other channels and organs.

3. Too high a condition in regard to flesh which in its turn is the cause of a greater production of blood.

4. Formation of the animal; cows with round barrel-shaped bodies being much more liable (other causes being equal) to attacks.

5. Length of time during which the animal has been dry; it being the case that cows which have been long dry are more liable to severe and fatal attacks. It has been suggested that this is probably due to the fact that such animals are usually in better condition, and from that fact their liability is increased, and the intensity of the attack increased.

As we have before stated, much more can be accomplished in the line of prevention than is generally supposed; the animal which has shown a predisposition to trouble from this source should be kept upon a low diet of succulent food for two weeks previous to her time of calving; food which will prevent constipation should be made use of, and all rich or oily food carefully avoided; if during pasture the animal should be kept on short grass or confined in a yard where the amount of her food can be regulated. Care should be taken that the bowels are in such a condition as will preclude the possibility of constipation, and if necessary purgatives in mild doses should be made use of. In cases where danger is anticipated it is well commencing immediately after calving to give tincture of aconite in doses of from thirty to fifty drops and at intervals of from three to five hours, the doses and its frequency being gauged to the severity of the attack; this we deem to be one of the best preventive measures, and after its adoption, during five years' dairy practice, we never had a case of paturient apoplexy in the herd.

Youatt writes: "The disease is an inflammatory one, and must be treated as such, therefore the patient should be bled." To this, in general terms, our best veterinary authorities take exception, and qualify the statement of Youatt by limiting the period at which blood should be drawn to the earlier stages or before the animal is down.

Dr. Hill writes: "When the animal is off its food, unsteady in gait, with accelerated though not feeble pulse, increased temperature of horns and ears, and a vacant or bewildered look, then the abstraction of blood is undoubtedly beneficial. But I hold that it is only admissible at this period, for when the disease has advanced and the patient is down with the more advanced symptoms it is entirely useless and tends rather to hasten the case to fatal termination than to lessen the severity of the symptoms. I have in no single instance seen good results followed bleeding except in this early stage, in which unfortunately the veterinary surgeon is rarely called in."

It is only during its early symptoms that the disease yields readily to remedies, and higher the condition of the animal, the more the brain and nervous system is seriously affected by the increased blood pressure.

Paralysis and Vertigo.

June 6th, 1888, G. C. Pennock, of Oxford, Chester county, Pa., reported that out of two car loads of milk cows just received from Baltimore, eight were unable to stand and others showed similar symptoms to a less degree; on the 8th the herd was visited by the Secretary in company with Dr. F. Bridge, the veterinary surgeon of the Board, and the animals found to be suffering from paralysis and vertigo. Several had partially recovered from the attack and after the use of proper remedies, all finally recovered.

Inquiry showed that during their passage from Baltimore some of the animals had been permitted to drink from a stagnant pool on "The barrens;" the owner fearing bad results, prevented the bulk of the herd from drinking, and thus saved them from a general attack.

Remedies prescribed were as follows:

1 pound sulphate of magnesia, 1 drachm of calomel, 1 ounce of powdered ginger; to be mixed and given in warm water to each animal affected. This was followed up with 20 grains of sulp. quinia in two ounces of whiskey diluted with the same amount of water, twice each day. Under this treatment the recovery was rapid and complete.

In such cases vertigo and paralysis may or may not be connected, and the connection is dependent upon the cause. In this case both existed and when combined, rapidly reduced the animal. Impaction of the third stomach may cause vertigo and in such cases is recognized under the name of "Fardel-bound" or "maw sick." In many cases where a post mortem is made and the third stomach found impacted, it is ascribed to this disease when in reality the condition is the result and not the cause of the disease. Any case of impaction of the third stomach may cause vertigo, no matter what its cause, and any case of paralysis may cause impaction, so that we very often find the two in close connection and it is then very difficult to decide to which the primary cause shall be assigned; no practitioner will attempt to prescribe without a careful examination of the case, and the result of this, as was the case with the cows alluded to, may often furnish a guide in the after treatment.

Paralysis (simple) may be due to a number of causes and in each case a different treatment is indicated, depending entirely upon the cause. In many cases it is due to indigestion, and in such cases the attack comes on gradually, one limb being usually affected at a time and a peculiar knuckling of the fetlock is often the first symptom observed by the owner; the weakness or paralysis gradually leads to the whole limb and to other parts (muscular) of the body. If it attacks the mucous coating of the stomach, we find constipation as a result (and not necessarily as a cause) and in other cases the brain is affected; in many cases, if the attack is due to imprudence in feeding, it will slowly pass off leaving the animal much exhausted; the after effects often disappear very slowly and the recovery may be assisted by tonics, such as were indicated in the Oxford outbreak.

Paralysis and vertigo (as an accompaniment) may be caused by the presence of any irritating form of food or water in the stomach, and in such cases it is desirable to empty the stomach and bowels by the use of cathartics as soon as possible, for this purpose the dose prescribed above by Dr. Bridge, will prove valuable, and may be assisted in violent cases by injections, the object being to remove the irritating cause as soon as possible, and this may be done even at the expense of considerable exhaustion, because the trouble will increase as long as the irritating material is in the digestive organs, and it will pass off gradually after it has been removed.

One of the most common forms of vertigo in cattle is that known as "stomach staggers." It is usually due to sudden changes from dry to green food or *vice versa*, from fall pasture to dry hay with an insufficient amount of water; it may also be produced by eating over-ripe hay made from Hungarian grass, millet and other grass, producing an abundance of dry small seeds. It is quite possible that some of our coarser grasses may exist in sufficient abundance in certain pastures to produce the same effect.

A case of lead poisoning reported by a stock owner near Carlisle, presented symptoms and results exactly similar to the forms of vertigo produced by improper or indigestible food, and yielded to the treatment prescribed for vertigo. A sudden change from soft to hard water will cause an outbreak of this trouble in some horses and no doubt in some animals of the bovine tribe also.

Dr. Law, in his "Farmer's Veterinary Adviser," states that animals eating *Lolium temulentun* (darnell) are usually attacked with a form of vertigo and paralysis, which often only affects the hind quarters, leaving the fore legs and brain comparatively free from its effects. It is also stated by good authority that ergot will produce similar effects, especially in cows and mares. In fact it may be assumed that any undue irritation of the urinary organs may cause this trouble, and if the cause is continued, may end in death from complete paralysis.

Texan or Spleenic Fever.

Texan, spleenic or Spanish fever is a special form of anthrax generated in the southern or gulf States and carried north in the systems of cattle, apparently not in any way affected by it, but at any and all times capable in infecting an unacclimated animal, with which they may come in contact, or which may come in contact with any of their excreta. It is believed to be of miasmatic origin and does not appear to seriously affect animals which have been for a long time exposed to its influence, but is unusually fatal to all western or northern animals with which it comes in contact. When by the progress made in veterinary science it come to be distinguished from disease grouped under the general name of "murrain," it was found to be due to contact with Texan cattle which were at that time the only southern animals, below the line of permanent infection, which found their way into our northern markets, and hence the name of Texan fever was given the disease. Later it was found that the spleen was one of the organs most seriously affected, and the term spleenic was added. Year by year its line of permanent infection has been pushed northward until we now receive cattle from several points below its limits. We are therefore much oftener exposed to the danger of infection and our annual losses have gradually increased until they have reached an amount which deserves the serious consideration of national lawmakers. From the middle of August to the last of September, we had in the State at least twenty-five distinct reported outbreaks and from the best data we can obtain we estimate the loss this year to stock owners of our State at $25,000, with the prospect of a still greater increase in the future unless some decided action is taken to prevent it.

Fortunately for us our western and native stock, while they are very susceptible to infection from southern animals, cannot convey the disease to others, and in them it is not of a contagious character. Southern animals moving north to Chicago and other cattle marts, carry with them the infection and impart it to all western and northern animals with which they come in contract, but these animals have not the power to infect others and hence the statement that in our native stock the disease is not contagious. Of the many outbreaks in this State during the past season, none were due to the direct introduction of southern cattle and hence none of the outbreaks extended beyond the animals actually infected by the first contagion, and neighboring animals were in no danger. Had the infection been brought into the State by southern animals, the disease would have extended indefinitely so long as the sources of infection were unkilled, or until the germs were killed by frost.

Of the twenty-five cases alluded to, twenty-three were of animals which had been infected at points outside of the State and afterwards sold to farmers for feeding. In two of the cases, one at Renova and the other at Leisenring, it was found that native cattle were infected. An investigation proved that in these two cases the mode of infection was not that usually found. In the case at Renova, western cattle unloaded at Buffalo, had been placed in a car which had formerly contained infected southern animals and they were thus infected. After they were unloaded at Renovo, cows around the depot and railroad had access to the car and to material thrown from it and were thus infected. At Leisenring it was found that cars from Chicago and points west, after the cattle were unloaded at Pittsburgh, were taken to Leisenring and other points in the coke regions and were there carefully cleaned out before they were loaded. Cows running at large had free access to the pile of manure and litter thrown from the cars, and were thus infected. In both cases the material from the infected cars would retain the germs of disease until a heavy frost put an end to all danger, and any native animal allowed to come in contact with them would be liable to infection. Except in these two cases all of the outbreaks reported this year had their origin in cattle brought from Chicago, either as fat for beef or for feeding during the winter.

In this as with other contagious diseases much more may be accomplished in the line of prevention that as a cure, and the remedy is simple, although its application is beyond the power of State officers. It would appear from the results in this State that the southern or infected animals are not moved north until about the middle of June, and that our danger of infection ends with the latter part of September; if then the movement north of infected southern animals was prohibited, except at such time as would secure two or three heavy frosts before their arrival in the fall, and after their movement north had ceased in the spring, all danger to northern and western animals would be removed, and our annual losses from this cause would cease.

Attempts will be made and are now being made to confine all southern animals shipped to Chicago, to certain pens and enclosures, and to carefully exclude all animals liable to infection, from these enclosures; the weakness of this plan is that our main danger exists in the cars in which the infected animals are brought north, and into which, in most cases other animals (liable to infection) are loaded for shipment to Buffalo, Pittsburgh, Baltimore and other points at which our stock feeders and butchers obtain their supply of cattle; during the past season the infections were about equally divided between the points named, but those coming to us through Buffalo, were from some unexplained cause, more fatal and caused a greater precentage of loss.

A leading authority thus gives the symptoms of this disease:

"It is characterized by a painless evacuation of a reddish-black, sometimes coffee colored, turbid, though not always abnormaly so, urine; this, after standing for twenty-four hours, throw down a brick-colored precipitate, which is sometimes streaked with blood. Rumination is suspended, and food is refused, though there is a moderate desire for water. The patient remains apart from other animals, with hanging head, ears drooping, viscid saliva flowing from the mouth, mixed with mucus from the nostrils, muzzle moist, an inconstant discharge from the eyes, and the conjunctiva pale, with the larger vessels prominent, but not enlarged. When the animals is standing the limbs approach each other; in the recumbent position they are fixed, the head being extended with the lower jaw resting on the ground; if an unsuccessful attempt is made to get up, the animal falls upon its side. Frequent respirations are accompanied by coughs and moans, though without any action of the abdominal and thoracic muscles. In a majority of cases the circulation keeps pace with the respiratory acts, the pulse numbering from 80 to 120 per minute, and as it increases it loses its tonicity. The action of the heart is, in general, scarcely perceptible."

It is unfortunate that in the direction of remedies we have little or nothing to suggest; thus far no line of treatment has been found which will enable the practitioner to effect a cure; after ten years experience the best that we can advise is the liberal use of tonics and stimulants for the purpose of assisting nature in throwing off the disease and to give the animal the needed strength to withstand its attacks. In the line of tonics we have thus far found nothing better that sulphate of quinea and chlorate of potash administered in the form of a powder, from a drenching bottle in connection with warm water; milk and water or water and whiskey; for a full grown animal, one drachm of the sulphate and a half ounce of the chlorate form a dose; this, in bad cases may be given three times each day, and in milder ones but once or twice, as may be necessary. Fresh eggs broken in sweet milk and given from a bottle will also serve an excellent purpose. In no case should purgatives be given; in many cases numbers of valuable animals have been lost by the free use of cathartics which reduce the strength of the animal at a time when it needs all of its reserve energies for the struggle for life. In most cases a strong dose of some purgative medicine is the first impulse of the "cow doctor" and the result is often more to be feared than the free course of the disease.

Glanders.

The nature and mode of propagation of this disease makes it one of the most dangerous with which horse owners have to contend. The facility with which it may be transmitted by contagion and by infection is so great that ere its existence is suspected, half the horses in a stable may be infected. Like other contagious diseases it has its period of latency or development, but this period is somewhat dependent upon the surroundings. If the animals are crowded into a close and badly ventilated stable it will spread with great rapidity, but if exercise1 in the open air, and not worked too hard, or if kept in well-ventilated stables, its progress is much less rapid.

By artificial innoculation it is found that the glands will, by swelling, show the effects of the disease in two or three days after the introduction of the poison, and that the discharge from the nostrils will commence in from three to seven days, under peculiar circumstances and surroundings the latent period is much longer, and under cases of infection, under unfavorable surroundings, it may be even shorter than the average timed named.

This disease has been divided into two classes or kinds, one proceeding from the other. In an irregular period after infection, acute glanders will set in, and if not in too violent a form, the animal may improve after the disease has passed a certain point, and instead of the acute form may develop it in the chronic or permanent form. When in its acute form its existence is so easily detected that no description is necessary, but when in the chronic condition it may exist unsuspected and undetected, and continue to form a source of contagion as long as the animal is alive.

In its chronic form this disease is one of the most deceptive with which we have to deal; the animal has to all outside appearances recovered; appetite has returned; swellings have disappeared; discharge from the nostrils has ceased; and all external symptoms have passed away; the owner congratulates himself that the animal is cured; but a little over-exertion; confinement in a badly ventilated stable; poor feed; exposure to wet or cold, and in fact anything which has a tendency to debilitate, may again develop the most unfavorable symptoms and endanger all animals coming into the stable.

Dr. Law, thus defines the symptoms of acute glanders:

"Languor, dry staring coat, red weeping eyes, impaired appetite, accelerated pulse and breathing, yellowish-red or purple streaks or patches in the nose, watery nasal discharge, with sometimes painful dropsical swellings of the limbs and joints. Soon the nasal flow becomes yellow and sticky, causing the hairs and skin of the nostrils to adhere together, and upon the mucous membrane appear yellow elevations with red spots, passing into eriaions and deep ulcers of irregular form and varied color and with little or no tendency to heal. The lymphatic glands inside the lower jaw, where the pulse is felt, become enlarged, hard, and modular like a mass of peas or beans and are occasionally firmly adherent to the skin, the tongue or the jawbone. The lymphatics of the face often rise as firm cords. An occasional cough is heard and ascultation detects crepitation and wheezing in the chest. The ulcers increase in number and depth, often invading the gristle and even the bone, the glands also become enlarged but remain hard and nodular, the discharge becomes bloody, fetid and so abundant and tenacious as to threaten or accomplish suffocation, and the animal perishes in great distress."

The symptoms of chronic glanders are of the same character as those given by Dr. Law for the acute form, the main difference being that they are not so well marked; the one distinction is that in the acute form the general health of the animal suffers greatly while in many cases of chronic glanders the animal appears to be in excellent health and has a good appetite; in some cases the ulcers are not visible or are located very far up in the nostrils; the glands are not swollen except when the animal is abused or exposed to wet or impure air.

An animal suffering from chronic glanders may live for years in apparent health and at the same time infect other animals which will die in a few weeks with the disease in its worst acute form. If an animal which has been exposed to the disease does not show its effects in fifteen to twenty days, he may be considered as safe.

No form of treatment can safely be recommended for either form of the disease and the interests of surrounding stock owners demands the death of the animal; aside from the danger to surrounding animals, it is very seldom that anything approaching a cure is affected and the animal is at all time liable to develop the disease in a more energetic state.

A peculiarity of this disease is that its contagion is spread with varying rapidity dependent upon the surroundings; thus cavalry horses at sea when confined under hatches during a storm, will develop the disease with astonishing rapidity, while the same number of horses exposed to the same danger of infection, but kept in a well ventilated stable and fed upon nutritious diet with a proper amount of exercise, would develop the disease very slowly. Owing to the fact that they have plenty of exercise, nutritious diet and open stables, ordinary farm horses develop the disease very slowly and under such conditions it may remain a long time on the farm before many animals are infected; in the crowded street-car stables, it on the other hand spreads with great rapidity and the cases are much more troublesome and dangerous.

In May last the secretary of the Board was notified that a disease of an unknown nature prevailed among the horses in and around Stroudsburg, and that it had thus far baffled the skill of the local veterinarian; the assistance of the Board was asked in order to determine its nature, and if possible adopt means to prevent its further spread. Dr. Bridge was sent to make an examination, and without hesitation pronounced the disease to be glanders and farcy; this not agreeing with the opinion of the local surgeon, Dr. Huidekoper was sent for and positively confirmed the diagnosis of Dr. Bridge. Dr. Bridge was again sent to make a careful examination of the horses of the vicinity, and during this and subsequent visits spent four days examining various animals supposed to have been exposed to the infection. A notice was inserted in each of the local papers requesting that all suspected cases should at once be reported to the postmaster and all such were carefully examined. By a careful examination all of the infected animals were located and their owners notified not to remove or expose them so that they could infect other animals; in spite of this notice three of the animals were removed, two of these were afterwards followed up and promptly killed; the third was traced into New York State and the search abandoned. So far as known every infected animal was killed and stables all disinfected, and it is believed that prompt action was the means of saving valuable animals which would otherwise have been exposed to the contagion; whether all infected animals were found or whether other cases will develop or not is yet to be ascertained, but the long period which has elapsed renders it probable that the disease has been effectually stamped out in that locality.

The act of June 2, 1887, assigns to the Board the duty of "preventing the spread of disease among domestic animals;" After consultation with the Attorney General it was decided that in order to prevent the spread of this disease it was absolutely necessary to kill the infected animals; this at once brought up the question of the right of the owners to some remuneration from the State; the appropriation applicable to this purpose being only five hundred dollars, the secretary did not think it advisable to use any portion of it in paying for animals destroyed, and hence a meeting of the citizens of Stroudsburg and of those interested was called and was attended by the secretary and surgeon of the Board, and by the president and secretary of the State Board of Health; at this meeting the exact status of the Board of Agriculture and its appropriation was explained and it was proposed that the secretary should issue certificates of value to each owner, and that the Legislature should be asked to make an appropriation to take up and redeem the certificates. As a portion of this agreement it was distinctly understood that the Board of Agriculture would assume no responsibility further than to ask that the Legislature should grant the appropriation and endorse the action of the secretary in issuing the certificates; this plan, having been endorsed by the Attorney General, was adopted and the animals condemned and appraised by sworn and disinterested appraisers and certificates issued to each owner for two-thirds the amount of the appraisement.

The original appraisement amounted to $1,039.97; to this has since been added the amount of $116.87 for another animal condemned and killed, thus making the total amount of certificates issued $1,156 64.

In conducting this appraisement the secretary had one precedent as a guide; in the suppression of contagious pleuro-pneumonia (under the provisions of the act of May 1st, 1879), had been found to be a good policy to allow the owner a fair value for animals condemned, as he would otherwise have an inducement to sell the diseased animal and thus defeat the ends which the law was intended to secure. In the Stroudsburg cases, the appraisers decided to first appraise the animals at their just value as well, and have certificates issued for two-thirds of this valuation.

All the surrounding States have special laws providing for the destruction of glandered animals and for their valuation and appraisement, and Pennsylvania should also have such a law which should regulate all condemnations and appraisements so that no questions should arise between the owners and State officers as to the amounts to be paid. It would be wise to either fix a limit beyond which appraisement should not extend or fix a minimum price to be paid for each animal.

Anthrax Fever.

Under some one of its many forms, known as "Spleenic apoplexy," "Black quarter," Bloody murrain," and "Black leg," we every year meet with anthrax fever. It is usually confined in its attacks to the bovine tribe, but under aggravated circumstances is found in horses, dogs, sheep and swine, but in this country is seldom found except in cattle, because other animals are not, as a rule, subjected to the influence which cause the disease. In France it receives the name of charbon on account of the black condition in which it leaves the blood and portions of the carcass. In England it is especially fatal to young stock, and is there known as "Quarter evil." Each locality of the globe is affected more or less by some of its forms, and each has its own local name for the disease.

During the past season, August and September, its outbreaks have been more numerous, and the percentage of loss greater than in former years, this is no doubt due to the existence of certain peculiarities in the temperature and climate during the time named. In one or two cases the outbreaks were so general and the attacks so sudden that we had great difficulty in convincing the owners that their stock had not been poisoned. The disease, which is contagious, is transmissible to all classes of animals and to man. Dr. Law states that 15,000 inhabitants of St. Domingo died in six weeks from eating the flesh of animals having the disease, and that the Tartars perish in large numbers from eating the flesh of anthrax horses. Two years ago, during the progress of a case in Berks county, under the care of the Board, two men died from the effects of poison taken into their systems by skinning diseased animals.

Dr. Law thus states, in a condensed form, the causes which promote or which are liable to cause an outbreak of this disease:

"1. By the rich surface soil abounding in organic matter, and the impervious subsoil preventing natural drainage. 2. The frequent inundation of banks of rivers flowing through level countries and the drying up of ponds and lakes, leaving much organic deposit in their basins. 3. A continuation of warm, dry weather which favors organic emanations from such places as the above. 4. A condition of the system of the animal predisposing to the reception and growth of the poison, and consisting of loading the blood with plastic or waste organic matter, as in overfed plethoric animals, in those making flesh rapidly, and in the young and rapidly growing, in those rendered unhealthy by overwork, in pure air, unsuitable food or water. 5. Sudden chills when the poison is already present, hence extreme variations in the temperature of night and day. 6. A close, still atmosphere."

In our experience with this disease we meet with it most frequently among young and thrifty stock which are pastured upon wet and low meadows during the warm weather of July, August and September; in most outbreaks the young and best are first attacked and soonest succumb to the disease. If warm days in early September are followed by cool nights, we may expect outbreaks in situations favorable to its development; if animals are compelled to drink impure or warm and stagnant water, or remain in the hot sun without shade, an attack is very likely to be brought on; with pure, running water, shelter from the hot sun, nutritious pasture and well-drained upland, it is unknown, and it is only found where these conditions are not maintained. Such being the case, the first step towards mitigating an outbreak is to remove the animals from the conditions and surroundings which have been the cause; if they have been on low, wet pasturage, change them to dry and rolling fields; if they are in good condition and have been on heavy pasture, change them to shorter grass; if exposed to the hot sun, provide shelter; if the pastures are predisposed to the promotion of the disease, attacks may often be avoided by keeping the animals in the yard during the night or changing them to uplands at night; in many cases it is their presence on improper pastures which causes the trouble.

In the two leading outbreaks which this year came under our notice. Dr. Bridge, in his official report, gives the following as the supposed causes:

Herd No 28.—"The field where the stock had been pastured was a swamp submerged during the summer. Two years ago a neighbor had some cattle pasturing on this land and three of them died so suddenly that he thought they had been poisoned. They undoubtedly died from spleenic apoplexy."

Herd No 22.—"The pasture upon which they had been running was a low swamp and marshy, with much vegetable matter in a state of partial decomposition. As it is organic matter undergoing decomposition under the influence of a damp and warm atmosphere, thus furnishing the miasma which produces anthrax, I concluded that this swamp was the plague spot and advised that the cattle be placed on higher land."

The following description of the symptoms as taken from Dr. Bridge's official report of herd No. 22 will cover most of the cases brought to our notice, except that the attack was somewhat more virulent than the average:

"About the middle of August he first noticed four of his young heifers sick; they died the next day. In a few days a yearling steer was taken sick and died the second day; next a seven-year-old cow was taken and died on the the third day; then a spring calf which died next day. He now has one cow and one bull which I think will recover." In this case eight out of the herd of twelve died within a few days, all with similar symptoms and from the same cause.

In the case of this herd, Dr. Bridge thus states the symptoms:

"The symptoms were, first a loss of appetite, cessation of rumination, great debility, trembling, staggery gait, falling down without the power to rise, eyes dull and stupid, mouths usually filled with foaming saliva." The post-mortem revealed the following:

"Veins engorged with blood, lungs, liver and bladder more or less congested and enlarged, and their substance friable, the spleen twice the normal size of that organ and changed into a black semi-fluid mass, the bladder filled with bloody urine. Under the skin of some of the animals were blotches of black blood with very much the appearance of bruises."

In the case of herd No. 22, Dr. Bridge prescribed the following to be given twice each day:

Powdered chlorate of potash, one-half ounce.
Spirits turpentine, one-half ounce.
Solid extract belladonna, one drachm.
Linseed oil, four ounces.

When herd No. 28 was reported to the Secretary the symptoms as stated corresponded so closely with those of Texan fever (which is in reality another form of anthrax) that the following was at once prescribed:

Sulphate quinine one drachm, powdered chlorate of potash one half ounce, made into powder; one to be given each day to mild cases and two or three to more malignant cases. After the first dose the animals all improved in condition and eventually recovered. The addition of turpentine, as prescribed by Dr. Bridge, is an advantage, and those who are compelled to keep stock upon such pastures should be provided with the remedy, especially during August and September, for a few hours lost in obtaining the services of a veterinary surgeon may prove fatal to the animal.

Hog Cholera.

During the past year the swine breeders and feeders of the State have experienced less than the average loss of the past ten years from this disease. Several outbreaks have been reported, but none of them have extended over any great amount of territory. The one reported and investigated in Washington county probably caused more loss than any other outbreak during the year, but this was due to the character of the animals affected and not to the area involved, the animals being such as had been exhibited at local fairs in different parts of the State.

We usually expect to find outbreaks of this disease either among animals shipped from the west, or at points on our main lines of railways at which dead animals have been thrown off. The length of time which elapses between the shipment from the feeding point and their passage into the hands of the local feeder here, is sufficient for the full development of the infection, and hence the animals are generally on the cars or in the hands of the wholesale dealer when affected. In former years several serious outbreaks have taken place among animals in the hands of the Pennsylvania feeder, but the past season has been remarkably free from this class of losses. In some cases centers of contagion, first formed by the introduction of infected western animals, have spread and have included native animals in the hands of neighboring farmers; in such cases the infection is not usually checked except by freezing weather.

The disease is caused by contact either with infected animals or with some intermediate object, as the clothing of those attending to the sick and feeding the well, or the infection may be conveyed by any of the excreta of the diseased stock. A very common source of contagion is found in the cars which have carried infected animals from the west, and there is little doubt that the Washington county outbreak may be thus accounted for. Some of our best authorities claim that a carload of infected animals passing along the railroad may infect animals in pens near the line of the road.

The incubative stage of the disease will vary with the temperature and surroundings, and the percentage of loss will in great measure depend upon the care exercised in separating the sick from the well, and in preventing the spread of the contagion by intermediate objects. In warm weather the disease may be expected to manifest itself in about six days after infection, but in cold weather this period may be lengthened to two weeks. The primary symptoms are shivering, dullness, sunken eyes, a disposition to remain away from other pigs, great thirst, and increase in temperature, hot dry skin, and red blotches appear in different parts of the body, and as the disease progresses change to black; extreme soreness of the belly is one common symptoms, and great pain follows any kind of motion; in some cases severe diarrhœa sets in, but in others obstinate constipation is one of the characteristic symptoms; before death the animal usually loses the use of its limbs and finally dies in a stupor.

But little that is satisfactory in the line of treatment can be recommended. The careful removal of all sick animals will do much to prevent the spread of the contagion; as soon as an animal shows the signs of infection it should promptly be removed from the well. Those engaged in the care of the sick should upon no account be permitted to come in contact with the well, and the bodies of those which have died should be deeply buried and covered with quick lime. Numerous cure-alls are and have been advertised, but thus far veterinary science is without a remedy. Prevention is of great value and of great practical use; charcoal and copperas kept where animals may have free access to it, small amount of copperas fed with the slop, corn in the ear charred and fed in the troughs, limited amounts of carbolic acid in slop, all have their advocates and all appear to have exercised a beneficial effect. Dr. Bridge, the veterinarian of the Board, recommends nitrate of potash and bisulphide of soda, and has administered the mixture with excellent effects.

The experiments of Drs. Detmers, Salmon and Law appear to show that by innoculation the disease may be conveyed to sheep, rabbits and rats, and it is the opinion of many scientists that rats are in many cases potent factors in the spread of the contagion. There are no well authenticated cases of its transfer to the human race, and it is safe to infer that the only danger following the consumption of the flesh of diseased animals is that which exists when diseased meat is eaten.

Under date of Oct. 23, 1888, W. G. White, of Cross Creeks, and James Glass, of Burgettstown, wrote to the secretary of the Board as follows:

"We, the undersigned, together with S. A. McCalmont, of Hickory, and S. C. Work, of Buffalo, being exhibitors of swine at the Pennsylvania State Fair, held in Philadelphia, have contracted some disease among our swine, * * * * it is very fatal, and if not soon checked will prove a serious epidemic. We therefore appeal to you to investigate the matter and to give it your immediate attention, as we believe that if it is not soon checked it will prove very disastrous to this community."

The case was at once placed in the hands of Dr. Bridge, who reported it as hog cholera and at once prescribed the proper remedies and advised the usual precautions. At the same time, John McDowell, Esq., the resident member of the Board, and president of the State Agricultural Society, was requested, as member of the Board of Agriculture, to give the case an immediate examination. After a careful examination of each of the infected centers, he made on official report from which we extract the following:

"On October 1, 2 and 3, I visited the persons named in your letter of instructions, and also others in the same neighborhood having sick hogs; from all appearances, there can be no doubt that the disease is genuine hog cholera, contracted at some point away from home: none of these gentlemen state that it was contracted during their exhibition at our State fair, as no hogs were kept on the fair grounds for eleven and one-half months of the year, and all pens are thoroughly limed and disinfected before show animals are placed in them. This stock was taken from the State fair grounds to the fair at Waverly, New Jersey, and from there shipped home and afterwards exhibited at the Burgettstown fair. After this they were taken sick and many of them died. By special inquiry we learn that none of the hogs sold at the fair were taken sick after they were taken away, and that of the large exhibit of swine none were sick except those alluded to. I infer that the disease was not contracted in Philadelphia. The parties are no doubt correct in the opinion that the disease was contracted during the shipment, but they are unable to locate the point of infection.*

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* Note.—In his written instructions detailing him for the work, Dr. Bridge was directed to use all reasonable means to ascertain the source of the contagion and to trace the animals during ther whole passage. In his official report he uses the following distinct and positive language: "They left the State fair grounds in Philadelphia September 17 and spent one week at Beverly, New Jersey. The disease did not appear until October 11. The incubative period of the disease is from fifteen to twenty-five days. Had the disease been contracted at the Pennsylvania State fair, it would have shown itself among them before or soon after their arrival at home."

"The symptoms were as follows: The animals refused to eat, fell away rapidly in flesh, had more or less cough, which was accompanied by hoarseness and sore throat, lame in hind legs and stiff, unusual languor, eyes red and discharging matter, sometimes to such an extent as to deprive the animal of sight; some of the animals scoured badly while others were constipated; the disease was generally fatal and ran its course in a few days, though in some cases the animals lingered. It is contagious, and may be carried in the clothing of persons coming in contact with the diseased animals.

"The owners are following the line of treatment recommended by the veterinary surgeon, but some are more particular than others with regard to sanitary measures; some kill all of the worst cases and bury the carcasses four feet under ground; they are also careful to separate the sick and well, and to prevent any one who has been in contact with the sick from going to the pens containing the well animals. It is by this and similar careful treatment that we hope to stamp the disease out."

In this outbreak all the evidence points conclusively to the theory that the animals exhibited at the State fair, *at some point after leaving the fair grounds*, came in contact with infected matter which conveyed the disease. The indications are that the cars in which they were shipped are directly chargeable with the losses which followed the outbreak. Our investigation and that of Mr. McDowell clearly shows that the infection was not encountered in Philadelphia.

SUPPRESSION OF CONTAGIOUS PLEURO-PNEUMONIA.

By the Special Agent of the Governor.

In his report to the Board (as its secretary) the writer has given a short and condensed history of the work of suppressing contagious pleuro-pneumonia as it is now (November 1, 1888,) being accomplished; in the present paper it is his purpose to more fully outline the work in its past history and to define the course by which it has reached its present satisfactory condition.

As a primary step to the accomplishment of this purpose he would ask that the reader fully disabuse his mind of the erroneous impression, which is held by many, that the Board of Agriculture is in any way responsible for expenses incurred in this work or for the manner in which it has been accomplished; in numerous cases the Board has been very unfairly criticised for imaginary sins of omission and commission, which had they been committed at all, should have been charged to the Special Agent of the Governor and not to the Board. It is true that the Board has repeatedly endorsed the work both past and present, but it has not in any way been responsible for any portion of it.

While it is natural that work of this character, depending very much as it does upon the judgment of a single individual, should be criticised, yet the writer has been repeatedly made to feel that the most severe (and at the same time most unjust) criticisms have come from individuals who should have (from their position) supported the work, and instead of unfair and unjust criticisms should have endeavored first to ascertain whether their strictures were well founded, and if they were, to have endeavored to correct existing evils in a proper and fair manner. In many cases the agent of the Governor has been criticised for not destroying certain herds because, in the opinion of the critic, they were infected, when it had been clearly proven by the most competent authority that no pleuro-pneumonia existed; in other cases he has been severely criticised for not killing animals in infected herds when an examination, even by a non-professional would have shown that both tuberculosis and pleuro pneumonia existed in the herd, and that the Governor's agent was powerless to destroy cases of the first-named disease. In all cases and at all times the work has been open to the most rigid scrutiny and examination, and all the accounts have been so arranged as to afford the most ample facilities for rapid and close scrutiny. All the work has been openly performed and nothing has been concealed; and at any time inquiries in relation to the work have received early and full answers.

Early in 1879 the attention of the writer was called to an attempt then being made by the States of New York and New Jersey to stamp the disease out by State action; proper laws had been enacted; officers had been appointed; appropriations of an extravagant character had been made, and the machinery for carrying the laws into effect had been fully organized. Believing that the time had come when our State could properly and practically engage in the work, the matter was brought to the attention of the joint committee of Agriculture of the Senate and House of Representatives, then in session; after the evidence of the work done in the two States named had been laid before the committee and the nature and character of the disease and of the work needed to eradicate it had been explained, a sub-committee was appointed to prepare and present to the Legislature a draft of a law which would enable the Governor to take proper action; realizing that it would require some time to obtain the necessary authority in the form of a law, the committee offered the following joint resolution which received the unanimous approval of both branches of the Legislature.

"WHEREAS, The States of New York and New Jersey, by recently enacted laws to prevent the dissemination among live stock of the disease known as pleuro-pneumonia, now invite this State by a concert of action to assist them to eradicate this contagion; therefore,

Resolved by the Senate (if the House of Representatives concur), That the Governor be and he is hereby authorized to take such preliminary steps as may be necessary to prevent its further spread."

A commission was appointed by Governor Hoyt, to examine into the matter and suggest the best method of accomplishing the proposed work; their report was unanimously in favor of immediate and combined action.

The act presented by the joint committee of both houses was given precedence and carried through its several stages as rapidly as the provisions of the Constitution would permit, and received the Executive approval May 1, 1879, the act is as follows:

AN ACT *to prevent the spread of contagious or infectious pleuro-pneumonia among cattle in this State.*

SECTION 1. *Be it enacted, &c.,* That whenever it shall be brought to the notice of the Governor of this State that the disease known as contagious or infectious pleuro-pneumonia exists among the cattle in any of the counties of this State, it shall be his duty to take measures to promptly suppress the disease and prevent it from spreading.

SECTION 2. That for such purpose, the Governor shall have power and he is hereby authorized to issue his proclamation, stating that the said infectious or contagious disease exists in any county or counties of the State, and warning all persons to seclude all animals in their possession that are affected with such disease or have been exposed to the infection or contagion thereof, and ordering all persons to take such precautions against the spreading of such disease as the nature thereof may in his judgment render necessary or expedient; to order that any premises, farm or farms where such disease exists or has existed be put in quarantine, so that no domestic animal be removed from said places so quarantined, and to prescribe such regulations as he may judge necessary or expedient to prevent infection or contagion being communicated in any way from the places so quarantined; to call upon all sheriffs and deputy sheriffs to carry out and enforce the provisions of such proclamations, orders and regulations, and it shall be the duty of all the sheriffs and deputy sheriffs to obey and observe all orders and instructions which they may receive from the Governor in the premises; to employ such and so many medical and veterinary practitioners and such other persons as he may from time to time deem necessary to assist him in performing his duty as set forth in the first section of this act, and to fix their compensation; to order all or any animals coming into the State to be detained at any place or places for the purpose of inspection and examination; to prescribe regulations for the destruction of animals affected with the said infectious or contagious disease, and for the proper disposition of their hides and carcasses, and of all objects which might convey infection or contagion, (provided that no animal shall be destroyed unless first examined by a medical or veterinary practitioner in the employ of the Governor as aforesaid) : to prescribe regulations for the disinfection of all premises, buildings and railway cars, and of objects from or by which infection or contagion may take place or be conveyed; to alter and modify, from time to time, as he may deem expedient, the terms of all such proclamations, orders and regulations, and to cancel or withdraw the same at any time.

SECTION 3. That all the necessary expenses incurred under direction or by authority of the Governor in carrying out the provisions of this act, shall be paid by the Treasurer upon the warrant of the Auditor General, on being certified as correct by the Governor: *Provided*, That animals coming from a neighboring State that have passed a veterinary examination in said State and have been quarantined and discharged, shall not be subject to the provisions of this act.

Under the authority conferred by the second section of this act, Governor Hoyt appointed the Secretary of the Board of Agriculture as his Special Agent to carry into effect the provisions of the law; he, by a special commission, transferred to his agent such powers as were granted to him under section second, and authorized such expenses as come within the provisions of section third, under Governors Pattison and Beaver this commission has been continued and revived, and wherever the disease was found it was at once attacked, and all infected animals killed. From May 1, 1879, to April 1, 1888, the work was carried on continuously, and without interruption. At sundry times no cases were found for several months, and the State appeared to be free from the disease, but each autumn as soon as our dairymen commenced to purchase cows for winter dairies, the infection was again introduced. In most cases the infection was brought into Lancaster and York counties from Baltimore, but on one or two instances it was traced directly to the drove-yards of New York. One of the most disastrous and extended outbreaks since the passage of the law, was directly due to the introduction of young animals from New York city; in each case the infection was traced to its origin when it was possible to do so, but in many cases the deception practiced by dealers prevented all attempts trace it.

All animals condemned and killed were at once paid for in accordance with regulations endorsed by the Governor, and so far as known, owners and others interested were satisfied with the work. All payments for animals killed were made in cash, the special agent of the Governor furnishing the necessary funds, and afterwards accounting to the Auditor General, and receiving a requisition upon the State Treasurer for the proper amount. It should be understood that each bill of expenses was first approved in writing by the Governor's agent, next by the Governor, then by the Auditor General, and lastly by the State Treasurer. After these approvals had been secured, the Governor's agent was remunerated for his outlay. Such a course compelled a careful scrutiny of all accounts; for should any fail to receive the approval of any of the officers named, no restitution was practicable.

Early in the year 1888, the National Bureau of Animal Industry received a liberal appropriation from Congress, to be devoted to coöperation with the different States in an attempt to complete the work already commenced under State action. New York, New Jersey and Maryland had accepted terms of coöperation, and the cities of New York and Baltimore, with their surrounding territory, had been placed under quarantine and in charge of officers working under State authority. Our main sources of infection had been shut off by quarantine more or less effective, and it appeared that the proper time had arrived for accepting coöperation with the National Department of Agriculture. All previous attempts at coöperation had been prevented by the difficulty of harmonizing the action of State and National officers working under different laws, which had been framed without any regard to harmony. Under the administration of Governor Pattison an attempt to secure coöperation had been made. but from the dificulty of securing the necessary harmony of action, it failed to produce results. It was admitted that the power to condemn and kill diseased animals existed only in State officers, and that National officers only had jurisdiction over live stock actually in transit from one State to another.

After an extended correspondence, the Governor's agent at last succeeded in securing terms of coöperation, by which all interests were apparently harmonized which involved no breach of the points laid down by the act of May 1, 1879.

After securing what was believed to be a proper and fair arrangement by which the State should furnish the power and the National Government the funds, the writer laid before Governor Beaver the following draft of agreement:

First. A sufficient force of veterinary surgeons and non-professional assistants to be placed in the field by the Bureau ot Animal Industry of the Department of Agriculture, to carry on the work.

Second. The veterinary surgeons of the Bureau of Animal Industry will be commissioned by the Governor of the State of Pennsylvania as State officers, to make a complete and thorough examination of the district hereinafter specified; and they will be given as such State officer the right to enter upon any ground or premises for the purpose of inspecting, examining and tagging animals; non-professional assistants will also be commissioned as State officers; all commissions to be dependent upon competency and good behavior, and subject to revocation by the Governor for good and sufficient cause.

Third. The Governor of Pennsylvania will issue a proclamation of quarantine, covering a district in and around the New City Hall of Philadelphia, having a radius of six miles distant from the new City Hall, and will prohibit the movement of neat cattle from one herd to another, or along a public highway, or on any unenclosed land without a permit from an inspector of the Bureau of Animal Industry, and provide that notice shall be given to the chief inspector of the Bureau of Animal Industry prior to the slaughter of any cow or cows within that district, so that *post mortem* examinations may be made of the carcasses.

Fourth. Dr. F. Bridge, State Veterinarian of the State of Pennsylvania, will be appointed as an inspector of the Bureau of Animal Industry, and receive his compensation from said bureau. Whenever any animals are reported by any of the inspectors as being diseased with contagious pleuro-pneumonia, Dr. Bridge is to be notified at once and detailed for the purpose of affirming or disaffirming the diagnosis. Should there be any difference of opinion between the officers first inspecting and Dr. Bridge, as to the existence or non-existence of the disease, the chief inspector of the bureau for that district shall, if he deems it advisable, purchase the animal of the owner and have it slaughtered, so that the *post mortem* may determine which diagnosis is correct.

Fifth. All herds found to be infected with contagious pleuro-pneumonia or have been exposed to this disease will be purchased by the Bureau of Animal Industry and slaughtered, and all premises where the contagion has existed or is supposed to exist, will be thoroughly disinfected at the expense of bureau. Should owners of diseased or exposed animals refuse to sell, they will be appraised, condemned and slaughtered by the State, and the Bureau of Animal Industry will pay the appraised value. No registered animal to be valued at over one hundred and fifty dollars, and no unregistered one at over sixty dollars.

Sixth. The officers of the Bureau in carrying on this work as officers of the State of Pennsylvania, are to receive all the protection and assistance needed by them to successfully perform their duties, and the sheriffs, deputy sheriffs and other peace officers within this district are requested to assist the bureau officers when called upon.

Seventh. All violations of the proclamation of the Governor will be prosecuted by the State authorities, so that the work may be thoroughly done. The chief inspector of the bureau will report from time to time to Thomas J. Edge, special agent of the Governor, the work that is being done, and shall consult him from time to time as to the progress of the work, and furnish him with all information asked for. The chief inspector will likewise be guided by instructions from Mr. Edge in carrying on the work, so far as these are not inconsistent with the rules and regulations established by the Commissioner of Agriculture.

Eighth. The same record of the work done as is now made in the city of New York and in the city of Baltimore, will be made in the city of Philadelphia.

Ninth. All expenses of this work, including salaries of the inspectors and non-professionals, the cost of disinfection and all other measures taken to stamp out the disease will be paid by the United States Department of Agriculture.

These articles of agreement may be amended from time to time, or added to by the joint consent of the special agent of the Governor of Pennsylvania and Dr. Salmon, Chief of the Bureau of Animal Industry.

At the time the agreement was concluded, no case of infection was known to exist either in the specified district or in other parts of the State, and as the act of 1879 involved a notice of and a request for quarantine, the following plan was proposed by the writer and adopted by Governor Beaver:

First. A meeting of the veterinary surgeons of Philadelphia was called, and after the matter had been properly explained they unanimously recommended that the quarantine be declared.

Second. The State veterinarian recommended a quarantine.

Third. The special agent of the Governor certified that such a step was advisable for the purpose of ascertaining the existence or non-existence of the disease.

These three certificates were placed on file in the proper office, and the Governor, under date of March 21, issued the following proclamation:

WHEREAS, By the provisions of the act of General Assembly of Pennsylvania, entitled "An act to prevent the spread of contagious or infectious pleuro-pneumonia among cattle in this State," approved the first day of May, Anno Domini one thousand eight hundred and seventy-nine, it is made the duty of the Governor to take measures to promptly suppress the disease known as contagious or infectious pleuro-pneumonia, whenever it shall be brought to his notice that the said disease exists among the cattle in any of the counties in this State;

And whereas, The existence of the said disease among cattle within the district hereinafter defined, has been brought to my notice, and the necessity for prompt measures has also been made known to me through the proceedings certified to me of a meeting of the veterinary surgeons of Philadelphia, and from reports of Francis Bridge, V. S., State Veterinarian, and Thomas J. Edge, special agent of the Governor under said act of 1879;

And whereas, The proper authorities of the States of New York, Maryland and New Jersey have taken action with reference to checking the spread of said disease;

And whereas, The proper authority of the Government of the United States is taking measures for the investigation, suppression and extirpation of said disease among neat cattle in the cities of New York, Baltimore and Philadelphia; now, therefore,

I, James A. Beaver, Governor as aforesaid, in compliance with the provisions of the above recited act of the General Assembly, do declare the following regulations to be in force from and after the ninth day of April, Anno Domini one thousand eight hundred and eighty-eight, in that part of the Commonwealth within the limits of a curved line having a radius of eight miles from the new City Hall of Philadelphia, and extending from a point on the Delaware river northerly of said City Hall, to a point on the Delaware river, southerly from said City Hall.

1. Medical and veterinary practioners, with the title of veterinary inspector, and such other persons as may be necessary with the title of assistant inspector, will be appointed with authority to visit, inspect, register and tag all cattle within said district; to inspect, appraise and slaughter such cattle as may be found to be infected with contagious pleuro-pneumonia, and such as may have been exposed to the danger of such infection, and generally to enforce these regulations.

2. All cattle within the said district shall be tagged, numbered and registered by the proper officers and all persons will be accountable for such cattle, dead or alive, as are registered to them, and all such persons are required to report to the proper veterinary inspector all cases of sickness, and all births and deaths among such cattle.

3. All persons having cattle in possession within the said district are hereby required to retain such cattle securely on the premises where they now are, and not to remove them without a special permit from the proper veterinary inspector.

4. All cattle within the said district, excepting cattle actually in through transit on railroads, boats or other means of public transportation, shall be kept off all highways or unfenced places, unless in charge of some person having special permit executed by the proper veterinary inspector identifying the cattle, naming the owners, specifying the date or dates on which they may be moved, and stating the places whence they come and their destination.

5. Butchers are prohibited from receiving any cattle from within the said district unless such cattle are removed, under the permit above mentioned, and also from killing any animal received with such permit, except in the presence of a veterinary inspector who shall examine the animal and note the description of the same from such permit.

6. Persons owning or operating rendering works are prohibited from receiving any cattle from within the above described district for slaughter, or any dead cattle, without a permit from a veterinary inspector, and from skinning, or removing the tags from such animal, except in the presence of such inspector, who shall examine the said animal and note the description of the same from the permit.

7. Thomas J. Edge is hereby authorized and deputed to sub-district the territory above described, to assign the various appointees hereunder to their respective duties, and generally to supervise the execution and enforcement of these regulations.

Under this proclamation and the above agreement, the work of co-operation was commenced April 9, and has been continued without interruption or impediment. Competent veterinary surgeons were commissioned by Governor Beaver, and they have examined, registered and tagged all stock within the district specified in the quarantine proclamation. All cases of disease have been examined and recorded and all herds found infected have been purchased, condemned and slaughtered, and the full appraised value promptly paid by the Bureau of Animal Industry, and the work thus far (November 1), has been satisfactory to all parties interested, the Governor's agent has received daily reports of all work done and of all animals examined, registered and tagged, and of all post-mortems and cases of disease, and it may now safely be asserted that there are no cases of contagious pleuro-pneumonia within the quarantined limits. By the previous work of the State officers it had before been eradicated from the balance of the State, and it is now believed that the State is free from the disease. Inasmuch as other centers which formerly furnished the infection are under the charge of National and State officers, and the same system of registry and examination in force, it is believed that our chances of reinfection have been reduced to a minimum.

At all times since his appointment the Governor's agent has insisted that the extent to which the disease prevailed in the State has been greatly overestimated, and the result of every examination, either by State or National officers, has proven the correctness of this opinion. At all times during the past eight years the surgeons of the Bureau of Animal Industry have had free access to all parts of the State for examination. In several cases, at the request of the State officers, special examinations have been made by officers of the National department, but no case of infection has been found. In several cases they, with the assistance of the State officers, were able to contradict reports of infection and to officially disprove their correctness.

At all time since the inauguration of coöperation all suspicious cases have been promptly reported to the chief inspector in Philadelphia, and as promptly examined by him. In all such cases the reported existence of the disease has been proven incorrect.

The efficiency of the work in the State at large, and outside of the quarantined district. has been largely due to the active coöperation and efficient assistance of Dr. Francis Bridge, State Veterinarian, whose practical knowledge of the disease has enabled the Governor's agent to carry on the work economically and effectively.

Within the district quarantined Dr. W. S. Devoe, and later, his successor, Dr. A. C. Young, have by their cheerful and active coöperation assisted in securing the result for which the quarantine was declared.

HOW TO MAKE FARMING PROFITABLE.

By JOHN I. CARTER, *Chatham, Pa.*

An important element in successful farming is keeping the farm in grass. This crop is valuable in itself; not only as an article of *sale*, but as food for farm-stock and a basis for manure. As it is a crop that usually runs a three or four years' course of farming, it seems especially important, that its whole treatment should be thoroughly good, from the selection of reliable and proper seed, the preparation of the soil on to its careful after-treatment. Notwithstanding this, there is more carelessness among farmers in the matter of grass-seeding than with any other crop they raise.

A walk over the farms of our country will show how poorly this work has been done. Not one field in a dozen presents that uniform mat of healthy, vigorous grass, indicating careful seeding and generous after-treatment. Even freshly seeded fields will show large bare spots every here and there, aggregating a heavy percentage of unoccupied land, thus seriously diminishing the crop.

This is not only a direct loss in quantity, but an injury to the remaining crop, from the addition of weeds and trash that fill the vacant places and are gathered in with the hay.

Clover, which stands at the head of our tame grasses, is a biennial plant requiring favorable circumstances to make it hold out during the grass course; but if the sets are strong and the soil conditions favorable, it will sucker to some extent and reseed itself also, thus keeping up the supply of plants. To secure this condition the ground should be well plowed and pulverized and the crop neither trampled to death by undue pasturage, nor mown too closely. In addition to this, it is well to sow the seed of some perennial plant, like timothy, with the clover, not only to last after the clover is gone, but to fill vacancies where the clover failed to take.

To sum up, farmers should keep the grass crop steadily in view, when seeding to the grain crops, using plenty of seed and of such varieties as usually do well in their vicinity. If the plants show a feeble development, surface manure freely, and if they still fail to retain a vigorous growth, until the grass course is ended, plow up the field!

A sod field that shows only some feeble grasses like foxtail, or still smaller plants, with neither tops to catch nutriment from the air, or roots to bore into the earth and disintegrate it, had better be plowed at once and a fresh start taken, for the chances are that the field will not only be unprofitable, but grow poorer as well. Of course there are some natural green-grass soils where time may make a green-grass sod, but such soils are not common by any means, and even here the process of sodding is is slow as to be of doubtful profit, hence for our arable land, clover should be our standby.

BASIC SLAG—ITS VALUE AS A MANURE.*

By GEORGE DICK, Esq., *Baltimore, Md.*

The discovery that basic slag is a phosphatic manure of the first importance cannot fail to interest agriculturists. It is well worth the inquiry whether greater fertility can be imparted to soils for general crops, than by the employment of other phosphatic manures.

The answer to this enquiry concerns not farmers only, but also manufacturers who produce this slag, and the community generally which is benefitted by every improvement in agricultural practice.

What is Basic Slag?

It will be recollected that about nine years ago Messrs. Thomas and Gilchrist made public the results of a series of investigations which showed that the iron ore of Cleveland, England, could be used for the manufacture of steel, by collecting the objectionable phosphorus in the slag. The Thomas-Gilchrist process, which is also known as the Basic-Bessemer process for the elimination of phosphorus from pig-iron, was first proved a success at the great works of Bolkon & Vaughan at Middleboro', and now at the Eston steel works of this firm, something like five thousand tons of basic steel are produced weekly.

Not only is the basic process in operation at many English iron works, but it has also been generally adopted in Germany and America. The presence of even a very small quantity of phosphorus in pig-iron is prejudicial to its quality. In order to remove this injurious element, the pig-iron after being melted in a cupola, is run into a large pear-shaped vessel, usually holding about sixteen tons of the molten metal. This vessel, which is called a converter, is movable upon its horizontal axis, is open at the top and pierced with holes at the bottom. The inside of the converter is lined with a basic material, a composition of lime, alumina and oxide of iron, made as follows:

Basic lining is composed of a material able to resist a very high temperature, and must be sufficiently plastic when damp to hold together when placed in the converter; the ganister therefore should contain about six per cent. of alumina. Potash and salt should be avoided, as they render the mixture more fusible. The following figures show the percentage of basic lining:

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* This article was prepared in answer to the question, "What is Basic Slag, and What is its Manurial Value?" asked at the Pottsgrove Institute.

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO
11.4	4.5	3.46	49.91	30.71.

The basic lining is prepared by calcining bricks made from finely ground magnesian limestone until all carbonic anhydride is expelled and the substance has shrunk to about half the original size. It is then ground to a rough powder and mixed with nine to ten per cent. boiled coal tar free from water. Water would slake the lime and cause the lining to crack. The mixture of tar and basic material may be thrown in plastic lumps into an annular space formed inside the vessel by the introduction of an iron cage, within which the fire is placed. The basic mixture soon becomes hot, melts, fills up the space and finally becomes quite hard. Or, it may be cast and baked into bricks, which after the removal of the molds are simply built around the middle of the converter.

Operating the Converter.

By means of a powerful blast, air is forced through the molten mass from the bottom of the converter. The oxygen of the air in passing upwards unites with certain of the constituents of the iron, and amongst others, with phosphorus which is converted into phosphoric acid. This unites partly with the lime in the lining of the converter, and also with lime which is added to the fused metal at the beginning of the operation. The phosphate of lime so formed, and the oxidized impurities collect on the surface of the molten metal forming the slag, which is removed by tipping the converter, leaving the desired product, basic steel.

The slag on cooling forms a somewhat brittle mass of a dark color, which has until recently been regarded as worthless. It is usually deposited in large heaps near the works, and generally it is considered of no value.

Within the past year or two a new industry has sprung up on the banks of the Tees, namely, converting the hitherto neglected basic slag into a valuable phosphatic manure.

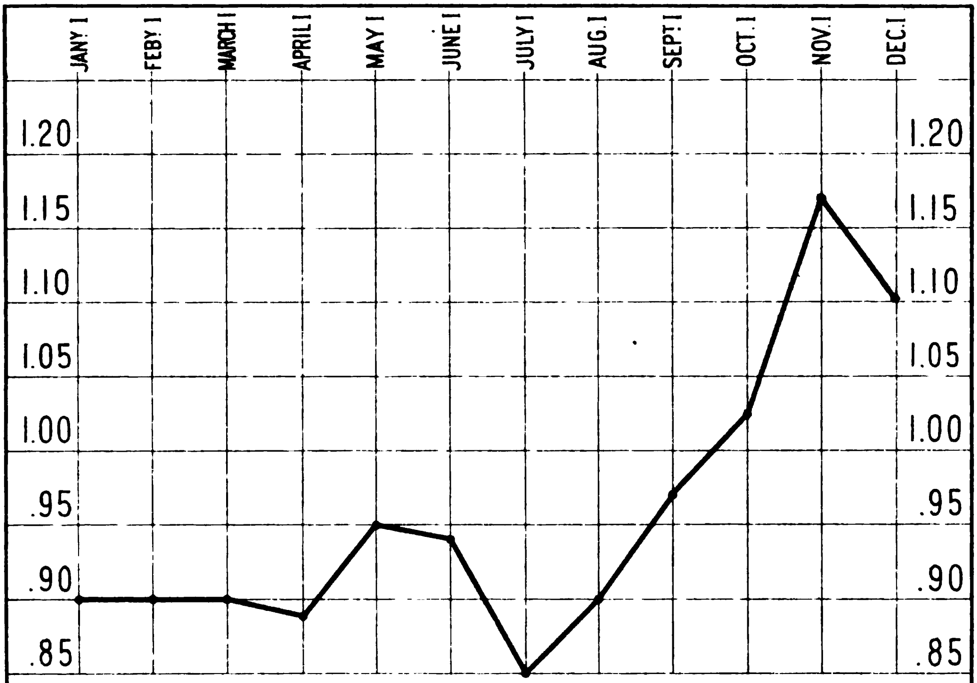
At the Carlton Iron Works, North Stockton, the production of basic slag manure is being successfully carried on; and at the North Eston Steel Works, Middleboro', costly machinery, it is understood, is in course of erection, to be devoted to the same useful purpose.

Basic slag, as mentioned in all the English and German reports, is that produced by the Thomas-Gilchrist process only. The patent for this process is owned by the Bessemer Steel Association of the United States of America, but has never been used by them. A prominent iron and steel company of Pennsylvania have obtained a right to use this process, and this company will prepare their slag as a special manure for the farmers of America.

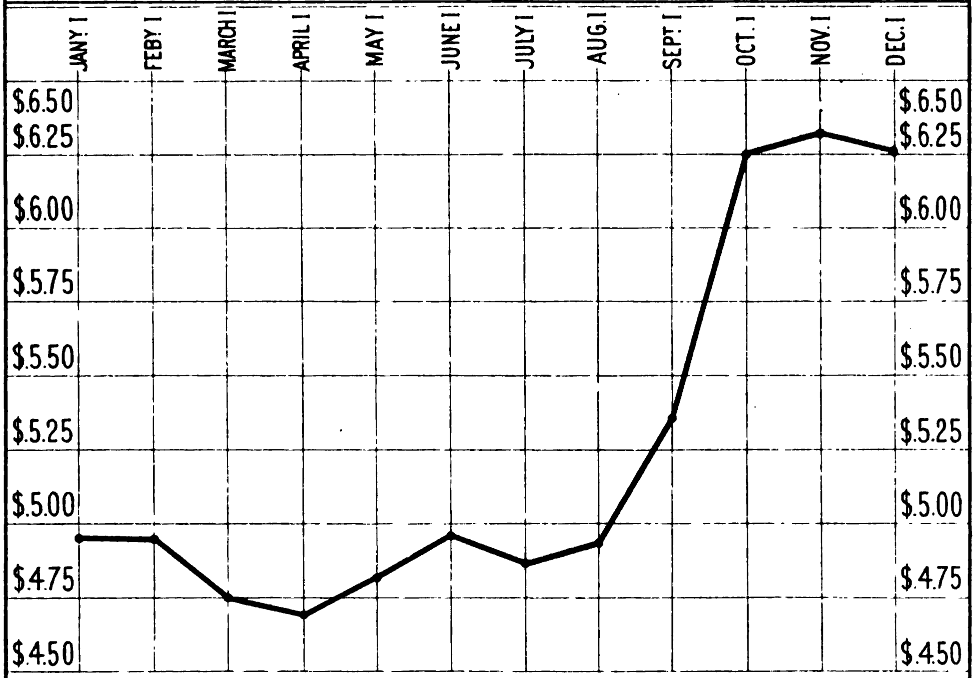
Thus we find that basic slag is formed by dephosphorizing the pig-iron in order to produce a malleable form of steel. The slag will contain from twelve to twenty-four per cent. phosphoric acid, according to the quality of the ore used.

Agricultural Reports from Slag.

Professor Dr. Paul Wagner, director of the agricultural laboratories at Darmstadt, has published the details and results of exhaustive



Prices of wheat - 1888.



Prices of flour - 1888.

investigations respecting the value of basic slag as a manure. Professor Wagner puts this pertinent question; can the crude, finely powdered basic slag be used as a manure? And shows that a closer study of the properties of that material has considerably changed the views hitherto current. It has been proved, that by simply crushing the slag to a fine powder the phosphoric acid contained in it acts more quickly and intensely, than the phosphoric acid, in either crude guano, or bone meal. The phosphate in basic slag contains a larger proportion of lime than any of the other phosphates in the manure market; and it might be supposed that its decomposition in the soil would be attended by greater difficulty than the decomposition of a phosphate containing a smaller proportion of line, it being well known that with increasing proportions of lime in phosphates of that base the solubility decreases, while the difficulty of decomposition increases.

The reason that basic slag phosphate does not follow this rule is explained by the assumption, that the phosphoric acid is in a state of super-saturation with lime, and that the combination is unstable, and easily assimilated by plants. Hence simply crushing the slag to a fine powder suffices to prepare it for the use of agriculturists.

Comparative Value of Basic Phosphate.

In order to compare the value of basic slag with that of other phosphatic manures, it was necessary that experiments should be carried out in an exact and scientific manner, and that from results so obtained the farmer himself, should draw his own conclusions. Professor Wagner fully enumerates in his book, the varied conditions under which his experiments have been made, and shows that full cognizance was taken of every factor which could influence them.

Experiments made with a great variety of plants, manures, and soils have given results from which the following table has been compiled, throwing the percentage of usefulness of various manures compared to super-phosphate taken as 100.

Phosphoric acid—in super-phosphate,	100
in Peruvian Guano,	30
in bone meal,	10
in coprotites,	9
in No. 1 basic slag, fine ground,	61
in No. 2 basic slag, fine ground,	58
in No. 3 basic slag, course ground,	13

In these results noticed immediately after the manuring and during three months of vegetation the effect of the guano was only one-third; and that of the bone meal only one-tenth, of that produced by super-phosphate; whereas the finely powdered slag, acted twice as powerfully as the phosphoric acid in the Peruvian guano; and six times more intensely than in the bone meal.

The value of basic slag apart from its phosphoric acid, depends entirely upon the degree of fineness to which it has been powdered; the slag must be ground to an inpalpable powder. After a certain degree of fineness the rapidity of action decreases quickly, as shown in the foregoing comparison.

Slag No. 1, is so finely ground that it passes through a sieve of 0.004 inch mesh, equalling the fineness of flour.

Slag No. 2. the action of which is somewhat inferior to that of the former powder, passes a sieve of 0.008 inch mesh.

Slag No. 3, passes through a sieve of 0.016 inch mesh, and although only twice as coarse as number two, only a fourth of the activity.

Professor Wagner further states that two pounds of basic slag, phosphoric acid given to the soil in the spring, will produce in the first summer after manuring, the same effect as one pound of superphosphate, phosphoric acid, where basic slag consists of not more than twenty per cent. of the coarse meal (No. 3), the remaining eighy per cent. composed of No. 1 and No. 2, fine ground. It will be borne in mind that no acid has been used in the treatment of the slag.

There are soils which exercise an especial influence on the activity of the basic slag phosphate, namely upon moor and peaty meadow soils.

Experiments were carried out on loamy soil (meadow) containing a medium amount of lime, and on a sandy loamy soil, containing a very small amount of this substance. Both showed that the slag phosphate acted more quickly than the phosphate of bone meal or of Peruvian guano.

Basic slag the learned professor observes, has an especial importance where it is necessary, to provide for the action of phosphoric acid over a period of several years.

In laying out pastures and meadows the slag gives great help where placed deep in the ground. He advocates the use of basic slag in vineyards, orchards and gardens, generally where deep working of the soil is usual; pointing out that there is here the opportunity of enriching the deeper layers of the soil with cheap and active phosphoric acid.

If beside basic phosphate, ammonuum sulphate be used, the two manures must not be strewn as a mixture, because of the lime in the slag would set the ammonia free, and thereby cause a loss of nitrogen.

Basic phosphate can be mixed with nitrate of soda and potash salts without fear of deterioration. It must be remembered however that such mixtures soon adhere and become hard, therefore they should be prepared shortly before using. An addition of a small amount of powdered peat prevents adhesion.

Basic Slag as a Fertilizer.

Mr. J. E. Stead, F. I. C., T. C. S., borough chemist of Middleboro', and analyist to the Cleveland Chamber of Agriculture, in a lecture recently delivered before the last named body, with special reference to the newly discovered phosphate of basic cinder, quoted the results of Professor Wrightson and Dr. Monro, who by application of four hundred weight of basic-phosphate per acre to land consisting of a stiff clayey surface in poor condition, quadrupled the yield of Swede turnips, and at Downton on a chalkey soil the crop was doubled by the application of ten hundred weight per acre.

In these experiments the cinder was less fine than that now produced. Where failure occurred the soil required other elements besides phosphoric acid, which were not added as they should have been. During the present year, one of the driest seasons known in that country for a long time, the natural rain solvent had not been available to carry the manure to the roots of the plants, otherwise the results would probably have been very different.

Disappointed farmers had, however, this satisfaction that during the winter months the phosphates would become thoroughly dissolved and distributed, and would next year bestow the benefits which have been reasonably expected this season. It has proved beyond a doubt that, wherever basic-cinder had failed, other phosphates, including superphosphates under the same conditions had failed also. Agriculturists might rest assured that basic-phosphate was of the highest manurial value, and that where apparent failure had resulted, what had been sown was like the bread cast upon the sea which would be found after many days.

Oxide of Iron in Basic Slag.

It has been supposed that owing to the presence of iron, the slag might have an injurious effect on the plants. The authorities in a decisive manner have shown that the fear of an injurious effect from iron in basic slag is altogether without ground should never have existed.

Professor Wiley, Department of Agriculture, Washington, D. C., says: "The quantity of ferrous oxide in the slag as given in the published analysis is thirteen per cent. This shows an addition of sixty-five pounds FeO per acre where 500 pounds of the slag are used. It seems to me extremely doubtful whether this small amount of ferrous oxide distributed over so large a surface could possibly prove injurious. Magnesia like lime is a plant food, but is not consumed by plants in large quantities. It appears from the analysis already cited, that about thirty pounds of magnesia would be added to each acre in the quantity of slag indicated. Magnesia acts beneficially in the soil in much the same way as lime, and especially by aiding in the decomposition of certain hydrous silicates, and the consequent liberation of potash and ammonia. In plants magnesia is especially abundant in the seeds and its physiologic function is therefore similar to that of phosphoric acid. It must not be forgotten also that by the use of magnesia in connection with potash or decomposing urine much of the ammonia may be saved by the formation of a double phosphate of magnesia and ammonia."

"Its presence, therefore, in basic slag is to be considered an advantage rather than an injury. The other substances in the slag are either harmless in themselves, or exist in such small quantities as to be utterly negligable."

"In the basic slag we see another bond cementing agriculture with manufacture, and the material prosperity of our country depends largely upon the mutual coöperation and support of our agricultural and manufacturing interests. In a few years many thousands of tons of the slag will be made annually. I look on this as an active addition to soil fertility. In scientific agriculture we should welcome every process which tends to make available stores of plant-food hitherto unavailable. A practice of agriculture which impoverishes the soil must be unscientific, but the farmer who leaves his fields richer than when he found them, has not only done his duty to himself, but to the future. In this direction the use of a waste product of an iron furnace is most promising."

Phosphoric Acid and Lime in Basic-Slag.

Phosphoric acid, says Professor Wagner, dissolves in water the less readily, and is taken up by the roots of plants with greater difficulty in proportion to the lime which its compounds contain. In superphosphates, for each 100 pounds of phosphoric acid there are forty pounds of lime. The superphosphate easily dissolves in water therefore.

In precipitated phosphate of lime there are eighty pounds of lime to the same quantity of phosphoric acid, and the solubility is much less than that of superphosphate.

Bone dust and guano phosphates have a phosphate of lime containing 120 pounds of lime to every 100 pounds of phosphoric acid, and this phosphate, as is well known, can hardly be dissolved in water.

In Thomas slag a phosphate is met with in which, for every 100 pounds of phosphoric acid, there are not less than 160 pounds of lime, but there is a hyper-supersaturation of phosphoric acid with lime, and they do not adhere strongly together. Plants can very easily, therefore, take up the phosphoric acid contained in Thomas slag. And it is not necessary to mix it with acids, or to extract it with muriatic acid and to precipitate the product with lime. All that is necessary, as said before, is simply to grind the slag to a fine powder.

Basic-slag treated with sulphuric acid—Slag analysis:

SiO_2	CO_2	S	P_2O_5	F_2O_3	Mgr_2O_3	CaO	Al_2O_3
6.20	1.72	0.56	19.33	9.73	9.50	47.60	2.58.

had 10.94 per cent. of its phosphoric, that is 56.6 per cent. of the total phosphoric acid soluble in ammonium citrate and, therefore, in a form easily assimilated by plants.

After treatment with sulphuric acid:

(1). One thousand grams slag, with 700 grams 66 per cent. sulphuric acid, the dried mass contained 12.13 per cent. phosphoric acid, of which 1.15 per cent. was soluble in water, and 9.35 per cent. in ammonium citrate, and 1.63 per cent. in hydrochloric acid.

(2). One thousand grams slag, with 1000 grams 66 per cent. sulphuric acid, superphosphate contained 8.07 per cent. phosphoric acid, of which 4.61 per cent. was soluble in water, and 2.75 per cent. in ammonium citrate, and 0.71 per cent. in hydrochloric acid.

After the lapse of three months matters had altered evidently on account of the iron present, and the quantity soluble in water was only 0.63 per cent. against 6.56 per cent. in ammonium citrate, and 0.88 per cent. in hydrochloric acid.

It will thus be seen that immersion with sulphuric acid is not profitable; but as more than half of the phosphoric acid is soluble in the soil, fluids containing carbonic are hydride, and hence is rendered available to plant roots. The slag can be used directly as manure.

There is an objection to this application, however, namely, the deleterious effects on plants of the lower oxides of iron and manganese, and of hydrogen sulphide resulting from a reduction of the sulphur compounds. This gives rise to the suggestion that the slag should be applied early in the autumn only to those fields which are not going to be tilled until the spring, so that the objectionable substances may become harmless by oxidation during the winter. Moreover it is advisable to strew the slag on the straw in the stable, or to place it in layers between the manure on removing it from the stable; in this way the oxidation of the noxious compounds goes on spontaneously, and at the same time the carbonic anhydride, formed by the decomposition of the manure, renders some more of the phosphoric acid available.

Practical Results from the Use of Basic-Slag.—Referring again to the notes of Professor Paul Wagner, the following results are given from actual copying:

Series No. 1. Meadow manurial experiments conducted at the Moor Experiment Station, Bremen, gave 33 per cent. as against unmanured soil, from a mean of four trials, with 500 weight of 20 per cent. phosphoric slag per acre.

Series No. 2. Two further experiments at the same place, upon a low lying moor, meadow of moderate worth gave 67 per cent. extra crop by manuring with 700 weight same slag per acre.

Series No 3. Schroder & Schensen obtained 78 per cent. extra crop by manuring a poor meadow with five and one-half hundred weight of slag per acre.

Series No. 4. Meadow manurial experiments conducted by various agriculturists in the Rhine provinces, at the request of Dr. Stutzer, gave 49 per cent. of extra crop as a mean of three experiments in different districts by manuring with four and three-fourths hundred weight slag, and forty-five pounds potash per acre.

Series No. 5. An extra crop of 19 per cent. gain was obtained with oats upon the farm of Talleschen, after manuring with two hundred weight of slag per acre; 52 per cent. extra crop by increasing the quantity of slag to 4¾ hundred weight per acre.

Series No. 6. Fr. Lachou obtained an extra crop of 30 per cent. grain, and 21 per cent. straw by manuring a field with three hundred weight of slag per acre.

Series No. 7. Extraordinarily good results were gained by Plotz from manurial experiments with oats upon a moor soil, treated according to Couraurer's method; by the use of four hundred weight of slag, and 4½ hundred weight of kanit per acre, he obtained:

(*a*) Extra crop of grain 121 per cent.; of straw 144 per cent.
(*b*) Extra crop of grain 157 per cent.; of straw 171 per cent.
(*c*) Extra crop of grain 154 per cent.; of straw 152 per cent.

We are thus shown how successfully the slag acts on soils where in consequence of a lack of phosphoric acid, exceptionally small crops have hitherto prevailed. Previous to manuring, the crop was only 880 pounds of grain per acre. Every one hundred pounds of phosphoric acid contained in the slag, have therefore produced on the average in these trials an extra crop of 1,937 pounds of grain, and 3,960 pounds of straw, valued at $40, for an expenditure of $3 for manure.

Preparing Basic-Phosphate for Agricultural Purposes.

At Glengamock the slag is first broken in a pulverizer, and then passed over a magnetic separator, by means of which, any pieces of steel remaining are picked out. The material is then passed through the grinding mills, and is dressed through sieves of a very fine mesh. The chief value of this manure lies in the reduced product being ground to a fine powder. If the material is scattered over the fields in a gritty state, it does not dissolve, and its value as a fertilizer is doubtful. That being so, it would seem the best method of obtaining an impalpable powder, is to use powerful crushing machines, or an improved attrition grinder, and separate the impalpable from the gritty portion by means of an air blast similar to that used in flour mills to separate the fine from the coarse products. An impalpable powder can never be obtained by dressing or sifting, and it can be done to a certainty by an air current. The product as it falls from the grinding machinery, is passed through a blast, and the current carries the impalpable portion over to a separate receptacle, while the gritty portion, by the law of gravity, drops straight down, and can be elevated again. In this manner the entire mass can be reduced to impalpable dust.

The Demand for Basic Phosphates.

German buyers have been sent over to England empowered to buy up all the basic slag they can find available, so that what have been unsightly rubbish heaps, and waste ground will now contribute to the produce and increase of the verdant pastures and the fruitful plains. It is a fact that cargoes of the waste material referred to, have been shipped from Middlesboro' to Germany, Denmark and Sweden and the present rate of shipment (1886), is something like 1,200 tons a week.

The North Eastern Steel Works turn out 800 tons a week and have a contract with Messrs. H. & D. Albert, large German manufacturers of manures, for 40,000 tons of basic slag for manure for a year; and this order has involved the laying down of extensive and costly plant.

The Supply of Basic Phosphates.

The discovery of this new process of making steel direct from the ore, is comparatively of recent origin, yet the output has been very great. The following table will show the progress of the basic or Thomas-Gilchrist process, for twelve months ending October 31. 1886.

The total make of steel and ingot iron from phosphoric pig during this period amounts to 1,313,631 tons, being an increase over the make for the previous twelve months of about 368,341 tons more ingot iron under 17 per cent. carbon.

The makes of various countries for the twelve months ending September 30, 1885, and October 31st, 1886, respectively as follows:

	1885.	*1886.*
England, ...	145,705 tons.	258,466 tons.
Germany, Austria and Luxemborg, .	617,514 "	883 859 "
France, ...	130,582 "	122 711 "
Belgium and other countries, ...	51 514 "	48 595 "
	945,317 "	1,313 631 "

It is noticeable that these 1.313,631 tons of steel represent 394,000 tons of slag containing from 30 to 35 per cent. phosphate of lime.

The demand for basic phosphates has become so great on the continent and in England that 400,000 are annually made in Germany and shipped all over Europe. It is but a question of time when a like demand will be called for in the United States. The once fertile fields of the great West are fast becoming depleted of their phosphoric acid. In the eastern section, and especially in the southern, the farm lands depend entirely upon acid phosphates and ammoniated phosphates to produce a crop, derived principally from South Carolina phosphate rock and some from animal bone for the source of their phosphoric acid.

SOME OF THE PHYSICAL RELATIONS BETWEEN PLANTS AND METEOROLOGICAL PHENOMENA.

By GEORGE W. HAYES, *Lebanon, Pa.*

In the consideration of this subject we will confine our attention to the present age. Were we to retrace our inquiring steps back into the hoary past, with its carboniferous age and extinct vegetation, luxuriant and varied in gigantic ferns and lycopods, much could be found to show how closely were interwoven the connection between the massive plant-life of that ancient age and the meteorological condition then existing; how the rank and profuse vegetation of an age rich in lepidodendrous and sigillaria purified an atmosphere heavily laden with carbonic acid gas, by the absorption of this foe to highly organized animal life, and the subsequent restoration of its oxygen to the atmosphere; the phenomena and change here referred to being partially physical and partially chemical. The clouds first invite our attention. Years ago the poet Shelley sung of "The Clouds":

"I bring fresh showers for the thirsting flowers,
From the seas and the streams;
I bear light shade for the leaves when laid
In their noonday dreams.
From my wings are shaken the dews that waken
The sweet buds every one,
When rocked to rest on their mother's breast,
As she dances about the sun."

Though not told in the language of the scientific method, but in a tongue that has often proved truer than much so-called science, the poet has beautifully hinted at some of the physical relations between clouds and plants.

The courser of the air and steed of the clouds, at one time gentle and subdued as in the morning zephyr, at another time fierce and ungovernable as in the tornado, the wind, is an important agent in plant life. In the fertilization of many plants the wind is the bearer of the pollen, and in such cases immense quantities of pollen are produced, as in the natural order of Coniferæ.

In these wind-fertilized plants the flowers are not showy, often more or less of a green color, and do not offer much of an allurement to insects; their pollen-cells are smoother and smaller, and better suited for transport by the wind than those of insect fertilized plants, the roughness of which make them easily attached to the bodies of insects.

The humidity of the air, precipitation and evaporation, next invite our consideration. In the earlier stages of the investigation of the hygrometric state of the atmosphere, the instruments were far from being as sensitive and accurate as those of the present day. Captain Kater's hygrometer was constructed of twisted Indian grass *Oobena Hoolo*), because of its singular property of twisting and untwisting according to the dampness of the air, and thus, by means of suitable mechanism, furnishing at least an approximate idea of the humidity. It is a well established fact that many plants derive most of their moisture from the aqueous vapor in the air.

According to Gray, "a vigorous branch of the common Live-forever (Sedum Telephium), or of many similar plants, will live and grow for a whole season when pinned to a dry and bare wall; and the Epiphytes, or Air-plants, as they are aptly called, must derive their whole substance immediately from the air." The foliage of plants are great condensers of moisture. Grass and leaves are often found covered with diamond-like drops of dew at sunrise, when gravelled walks, stones, wood-work, and metallic surfaces are almost dry.

As eminent an authority as Geikie, speaks of woods, forests and mosses, as *attracting* rain. Moisture is the principal climatic cause which determines the number of graminaceous species in any country;

in very dry countries they become much less numerous. Because of the alternate evaporation, which is largely dependent upon vegetation, and the condensation of water, it has been estimated that what actually falls in rain is re-evaporated and rained down (on an average throughout the world) ten or fifteen times in a year.

" In this way the atmosphere is repeatedly washed by the rain; and those vapors washed out which else by their accumulation would prove injurious to men and animals, and conveyed to the roots of plants, which they are especially adapted to nourish," to be again evaporated largely through the leaves, and again precipitated as rain laden with injurious vapors. The quantity of water exhaled from plants during active vegetation is astonishing. According to Gray, " A seedling apple-tree with eleven square feet of foliage, lost nine ounces a day. The amount varies with the degree of warmth and dryness of the air, and of exposure to light." Snow is emphatically the wintry blanket of vegetation. Lying unmelted and still, it furnishes a great protection to the face of the land, kindly shielding soils and plant life from the effects of frosts. According to Loomis, " In those places where snow lies unmelted from one year to another, it sometimes acquires a ruddy color, and occasionally becomes red like blood. This occurs in the polar regions, and also on the mountains of Southern Europe. In Spitzbergen the snow sometimes appears of a green hue. It has been discovered that these colors are due to a vegetable production resembling a mushroom, which is excessively minute, not exceeding $\frac{1}{1000}$th inch in diameter. There is then, a species of vegetation which may flourish at a temperature which never exceeds that of melting ice," making its home in a soil of perpetual snow. In an age when many of the potencies of that mighty and mysterious force are being subsidized to the advancement and benefit of mankind, we can also turn to plant life as a source of electricity, though not with strong hopes of its ever being brought into subjection as a source of electrical energy for the benefit of an advancing civilization. Vegetation is a source of electricity. During the day plants give out the negatively electrified oxygen; and during the night they exhale the positively electrified carbonic acid gas; these two processes in a measure neutralizing each other. Some have attributed the atmospheric electricity to this action of plant life, although this theory does not find many adherents in the arena of meteorological research. Trees differ considerably in their power of conducting the electrical fluid; the oaks and elms being considered good conductors; and resinous trees, such as pines, poor conductors. Whether resinous trees or not, it is never safe to seek trees as shelter during a thunder storm, as electricity is often very erratic and loves to surprise humanity by its strange and unexpected manifestations. The essential climatic difference between two countries in many cases depends upon the difference in the amount of vegetation present. When the ground is clothed with plant life, the heat of the sun falls directly on the vegetable covering; and, as none of it falls directly on the soil, its temperature does not rise nearly as high as if it were not clothed with vegetation; the temperature of the plants exposed to the sun does not rise so high as that of soil having no vegetable covering, a portion of the sun's heat being lost in evaporation, and the heat does not accumulate on the surface of the leaves as it does on the soil. " Hence," according to Alexander Buchan of the Scottish Meteorological Society, " the essential difference between the climates of two countries, the one well covered with vegetation, the other not, lies in this, that the heat of the day is more equally distributed over the twenty-four hours in the former case, and therefore less intense during the warmest part of the day" thus making the climatic conditions very much different from what they would be if the vegetation were scant and the soil largely exposed to the rays of the sun. Sir Walter Scott, in his "Marmion," with true poetic knowledge, sings

> "The scenes are desert now, and bare
> Where flourished once a forest fair,"

and this will be the sad dirge of every country that permits its forests to be totally destroyed. Vast wooded tracts are of the greatest value and affect most decidedly the economy of the glote. According to Humboldt and others, the direct influence of forests consist in their screening the soil from the heat of the sun's rays; by the immense surface the leaves offer to the cooling process of radiation; and by the copious evaporation of moisture from the leaves; some of the indirect benefits consisting in their tendency to maintain equable temperature and humidity; the influence they exert in controlling the regular flow of rivers, and the supply of perennial springs. The frosts of winter are much more severe in localities where the mountain slopes above them have been devastated of their forests by the ruthless hands of the wood-chopper.

When on slopes, forests exert a decided beneficial influence in winter in offering an obstacle to the descending currents of cold air; and in distributing the cold produced by radiation from the earth through a height of the atmosphere equalling the height of the trees. Forests tend to make the nights warmer and the days cooler, mitigate the extremes of temperature, and distribute daily changes more equally over the twenty-four hours; they diminish the evaporation, but increase the humidity. The soil of forests being generally more porous and friable than other soil, less rain runs away, and remains instead to be ultimately taken up by the roots.

Allow me, before leaving this subject, to quote from two scientific authors: Geikie, a geologist of world wide reputation, says: "The indiscriminate destruction of the woods in the Levant has been assigned with much plausibility as the main cause of the present desiccation of that region." Dr. H. Cleghorn, author of "Forests and Gardens of South India," and to whose writings I am much indebted in the preparation of this paper, says: "There can be no doubt that one of the causes of the terrible famines in India and China is the unwise denudation of mountain slopes, where the forests formerly absorbed a large portion of the rainfall which now quickly runs off to the sea."

In conclusion, let us devote a few minutes to the consideration of the so-called weather foretelling plants. Hanneman is the only writer whom we have found who gives a list of these:

If rain is imminent. The flowers of common Chickweed (*Stellaria media*) droop and do not open; the blossoms of Crowfoot anemone (*Anemone ranunculoides*) close; the blossoms of Bladder Ketmia or Flower-of-an-hour (*Hibiscus trionum*) do not open; the flowers of the Thistle (*Carduns acaulis*) close; the leaves of Red Clover (*Trifòlium pratense*) and its allied kinds, and Whitlow-grass (*Draba verna*) droop; the blossoms of Nipple-wort (*Lampsana communis*) will not close for the night; Yellow Bedstraw (*Galium verum*) swells and exhales strongly; and the American White Birch (*Betula alba*) exhales and scents the air.

Indications of rain. The flowers of Marigold (*Calendula pluvialis*) do not open by 7 A. M.; the blossoms of Hog Thistle (*Sonchus arvensis* and *oleraceus*) open; the flowers of common Pimpernel or Poor Man's Weather-glass (*Anagallis arvensis*) quickly close.

Rain of short duration. The leaves of common Chickweed (*Stellaria media*) open but partially.

If cloudy. The flowers of the Wind-flower or Wood Anemone (*Anemòne memorosa*) droop.

Termination of rain. The leaves of Red Clover (*Trifòlium pretènse*) contract; the leaves of Birdweed (*Convolvulus arvensis*) and common Pimpernel or Poor Man's Weather-glass (*Anagallis arvensis*) spread.

Uniform weather. The flowers of Marigold (*Calendula pluvialis*) open early in the morning and remain open until 4 P. M.

Clear weather. The flowers of the Wind-flower or Wood Anemone (*Anemòne nemoròsa*) stand erect; the heads of the blossoms of the Hog Thistle (*Sonchus arvensis* and *oleraceous*) close at and remain closed during the night.

This list probably contains both truth and error mixed, and should be applied with many grains of allowance; and a just appreciation of individual peculiarities in plants and differences in their environment. The poets have often sung of the relations between flowers and the weather; and I know of no more suitable way of ending this already too lengthy paper than by those beautiful lines of Darwin:

> "Weak, with nice sense, the chaste mimosa stands,
> From each rude touch withdrawn her timid hands.
> Oft, as light clouds pass o'er the summer's glade,
> Alarmed, she trembles at the moving shade,
> And feels alive through all her tender form
> The whispered murmurs of the gathering storm;
> Shuts her sweet eyelids to approaching night.
> And hails with freshened charms the rosy light."

THE RAISING OF PROPER CALVES.

By GEORGE BLIGHT, ESQ., *Philadelphia, Pa.*

In all dairy regions most farmers raise one or more calves each year. It is true his dairy is recruited by purchase from droves, which periodically pass by his farm, but if he were confident the calf he selected to raise would prove a satisfactory animal he would be induced to add more such to his dairy. It is my desire to aid and influence him to do so. It is a great satisfaction to watch the growth and development of your young stock, and to know from whence it sprung. This district of country is noted for the large number of cows kept to supply the city with milk, and is well adapted to the raising of young stock. When the calf is about three days old a careful examination should be made, to see if it has all the qualifications that are necessary for a milker—Is its form correct? Does it possess the marks that Guenon declares are essential? Are the teats well set, not all in a bunch? Is the curl on the back remote from the shoulders? Has it a deep crevice in the thigh bone? Is the hide thin? Is the color of its skin yellow? Is the tail long? These are the prominent marks to aid you in finding out the value of the animal. If it possesses all these you may be sure of securing a good cow; if it does not the heifer will grow up with a tendency to fatten, and when she becomes a cow will be too long dry. Is not the possession of this knowledge of great value? To raise a calf simply for beef will not remunerate when you have a ready demand for all your milk, but to be able, in the course of years, to have your dairy replenished by cows giving 18 to 20 quarts of milk is an inducement to raise such.

When you have determined what to do, the next step is to see that proper food be given regularly; the calf should be kept growing all the time that its qualities may be fully developed; if neglected and does not get its proper food the lacteal qualities will be impaired, and it will be difficult to restore them in after life.

I would by no means retard the maturity of the heifer; I would add her to the dairy as soon as possible; remember that a cow is called a milk machine; her business is to supply milk, and the sooner she commences the better for the animal and the farmer.

We all know how uncertain is the life of a calf; for the first four weeks how many are lost. My observation is a little food at a time, increasing the amount with age, adding ground oats and bran to the milk; the great secret is not to tax the digestion.

I prefer early calves—those born in April and May—they are then ready for the pasture and will grow rapidly, but do not fail to add the daily ration of grain. Before concluding I will add a few remarks on the selection of cows, using the language that Guenon makes use of, so as to familiarize and induce you to get his book and study it, satisfying your own minds whether he be right or not. Guenon's description of a first-class cow is one giving 20 quarts, averaging 10 quarts, or 3,000 quarts a year, dry one month; second-class yielding 15 to 17 quarts, averaging 7 quarts, or 2,400 quarts a year, dry two months; third-class is the lowest that should be allowed to remain in a profitable dairy, and only tolerated until they can be supplanted. They yield 10 to 12 quarts, average 5 quarts, or 1,500 quarts a year, dry three months. This latter class belongs to the general purpose cow of the farmer, that is, she will fatten when she begins to fail in her milk; no feed will cause her to yield more; the nourishment will go to the formation of fat, on the principle that a poor machine will only do so much work; so a poor cow cannot be made to do more than her quota; extra feed will form flesh, not milk. Hence it is incompatible to have a first-class milch cow and one that will fatten easily. The old saying is true, "the cow to milk, the ox to feed."

PRACTICAL METHODS OF PURCHASING AND USING COMMERCIAL FERTILIZERS.

By E. SHORKELY, *Lewisburg, Pa.*

The scope of the subject under consideration, will suggest to almost any one, who is thoroughly thoughtful, and attempts to analyse it, that in its most practical phase, an error has been made in the programme, in not giving to it, more liberally of talent that it might be presented in its broadest and best sense. And, at least one fact more, which faces us as farmers, in this attempt to work up the department of fertilizers is, the homemade made on the farm, as the residue or result of fundimental farm processes, is preëminently the best, all things considered, of any fertilizers the average conditioned farmer can possibly procure. Logically then, we can but preface our brief investigation with the strong approval, and most hearty recommendation, that all manurial and residual substances on the farm and about the buildings be carefully and most economically preserved and applied to the growing crops. Without itemizing, every one will understand what is meant by this word, all—don't allow one single pound to go to loss; utilize all excrement, all vegetable and plant growth, and uselessly growing and decaying weeds and grass; and when these, nicely composed, fall short of the amount needed, to grow gratifyingly and enjoyable, good and paying crops, then accept to your very best thoughts, the very best methods of purchase. One of the modern scientific agricultural sages, editorially asserts, "there is no reliable relation between the number of rings in a log of a given tree and its years of growth." The ancient, unlearned and uncultured farmer replies to this, in use of the living fact, that in a quarter of a century of his life, he planted, and lived in an uninterrupted possession of an ornamental maple, and when he cut it, for every year of its life and growth, on its stump, a clearly defined ring could be counted. Which of these two presentments shall we be willing to confide in? We have come here to-day, I trust, to get some practical and profitable facts, or formulas that we can take home to our farms and use to the practical ends in farming—to the elevation of our manhood and womanhood, and to our general agricultural betterment. Let the test of a living life in experiment and trial be applied to all truth, and let a general and friendly interest prevail in all interchange and investigation. Let us cease the scornful fling, that "an assayist is a theorist, and theory is nothing"—for "a fool when he holdeth his peace is counted wise; and he that shutteth his lips, is esteemed a man of profound understanding."

We come together there, on this question of the best modes of purchase, use and handling commercial fertilizers from the actual necessity that exists, after all diligence to save and make the very last pound on the farm. Now another fact forces itself upon us, we are not laboring to save and honorably sustain a new thing when we buy fertilizers to make the farm crops pay, and to preserve inviolate the proprietorship of farm homes!

This noble industry is ceaselessly keeping the life-tide flowing in every land of the civilized globe—it, to-day, here represents the cause and claims of over thirty millions of people in this broad land of ours—and it is an industry traceable, in its endurance and humility, away back through all the centuries, and is most remarkable for its characteristic acquiescence, submission and antiquity. On the opening pages of human life in history can be found unqualifiedly recorded acknowledgments of its paramount importance. Justified then in entering commerce or any of the lesser departments of the world's work than ours, we must percieve the wisdom of inter-communication and inseparable union of life and interest. But, we must also note the two distinct classes in our own industry, formed in all human casts—the one, eager to get and gather all for themselves that can possibly be acquired, and the other, willingly and anxiously giving of their time, talent and energy, and of their money if needs be, that their fellows of the present and future generations may be prosperous, happy and successful. It is not only important personally to farmers, that they are successful in producing their products and cereals, but it is evident to the unprejudiced thinker and worker, that it would be a public calamity if, from any cause, the agricaltural producing interests, should even for a season, in one single department only, result wholly self-destructive.

I offer no apology, therefore, in an attempt at presenting my "proper" thoughts, and giving my best, though crude and unfinished, ideas on a single line of betterment pertaining to one single department of the average farmer's methods, in the purchase, use and handling of commercial fertilizers. This, I take it, is an unadulterated farmer's meeting. However, I shall be glad to be corrected immediately if I am wrong in this assumption, and will close in squarely to the task of addressing those of whom I ,am one. The appropriation of money from the State Treasury, making the opportunity of programming this meeting possible, and holding it in our midst an enjoyable reality, is one of the innovations in favor of farming, very closely criticised by the class among us, in this connection to be known as gatherers; but, to the noble benefactor, the higher and broader intelligence, and the warm hearty helper in agriculture uplifting, there is a practical control of forces and opportunities most deservedly welcome. Farmers uneducated in organization and sympathy, and without good farm literature, are as oblivious to these surroundings, and as much alone, as if they were in a forest; and the simplest unification of purpose and coöperation of action, eliciting common interest and a wholesome generous knowledge of others than self, will be found to be a practical measure, for the proper development of practical policy, in the purchase, sale and use of any merchandise or commodity needed on the farm. The work of the home, if happily we do it, is to meet this very obvious demand. It is assisted without conditions, that "he who overcometh shall inherit," and in this implied line of labor can be found a broad opportunity for securing not only the best and most practical modes in this one separate part of farm business; but, it as clearly opens the essential lines of following to the most desirable improvement in all. So far as the public and common agricultural literature of the day goes, there is nothing in circulation, based on actual facts from experience, bearing upon this subject; and we very much need an aggregate of confidence in our own powers to test and experiment, by means of which, to follow some line of trial, and this line of tests for practical results, and these common sense results, for general education. How shall we find this line and these results? The Bible teaches that "the sluggard and all who deal with a slack hand, shall surely come to poverty." What we want, is to know how to attain the greatest favorable results at the least possible expenditure of time, labor and money, and this "least," must be placed upon the alter. This demand exists, not only in the department of farming under consideration in this discussion, but in every important line of agricultural interest the same action, thought and philosophy is absolutely indispensable to a return of prosperity. There is upon us, as a class, the fruit of inexcusable carelessness, inaction, ignorance and folly—no more perhaps than we deserve. and much less than will be realized, if the persistent adherence to these diabolic forces cannot soon be broken. In the department of commercial fertilizers there is a large class of manufactures, who, in their own interests and the interests of hosts of local agencies, desire the present order of things continued at all hazards; and though the agencies under their control are nominally in friendship with us and our methods, their general agencies compel obedience to rules of business ignoring all claim to integrity; and he who disinterestedly confides, will be the more likely to behold through its peaceful and fair minded modes, the decisive hit of fraudulent expedients.

Union county may be said to be the banner county of Pennsylvania, on this line of unenviable experience and distinction; and the banner too, can by her be as justly claimed, in pioneering better and more practical rules of procedure. For thirteen years, combination in the purchase of phosphates, and the union of effort and action, to get a broader range in fact and knowledge of it, and the last half of this period of time the State Board of Agriculture, through its courteous and very worthy secretary, has given the most meritorious aid to some unqualifiedly useful and practical methods.

To know that in their time commercial fertilizers worth much less than freight, could be largely sold in Union county at from twenty-five to thirty dollars more than cost per ton, was made possible to the live, wide-a-wake farmers, through the labors of the "State Board," and that such a "deal" cannot be repeated is abundantly assured by the fact of the friendly coming of the "Board" to Lewisburg to-day, and the peaceful agitation of the reforms needed in this and other departments of ours, the greatest industry of all the earth. But the existence of these conditions indicate increased complications in the very near future; and one object of this meeting will be well sustained, if the present and impending perils to the farmers' full share of progress, education and usefulness can be recognized, and the essential elements of defense promptly entered upon. Can we engage in an intelligent and comprehensive system of coöperation? If we can, why not? If we cannot, why?

Are there not very obvious reasons why in this one, and indeed all other departments of the farmers' pursuit, the downward tendencies should be accepted as a fixed condition? Has not the country's and nation's political and material growth and fixedness, and the great wave of emigration and invention in these last years, made a new and permanent change of momentous importance? Has not the time come for us, as a class, to make some demonstration of ability to comprehend the agricultural issues which are upon us and manfully combine to meet their almost limitless ills? The great practical question overshadowing all and coördinate with every compulsory purchase of any magnitude the farmer now makes, is, how can we so buy, use and handle, as that our homes can be felt to be unquestionably protected, and we happily certain of protected rights of proprietorship in our farms?

Whether it be commercial fertilizers or any other item of agricultural merchandise, if indulged in to the extent of common conditions of modern civilized comfort, systems of law and business in this country and government are such, as that only the forehanded tiller of the soil is free from absolute peril. Often represented and variously illustrated, we find this statement: "The strength of this government depends upon the character of the individual citizen. Whatever damages the citizen will injure the government. Whatever elevates the citizen will elevate the government, and to ruin a republic you simply have to ruin its citizens." As farmers and citizens, we are wholly responsible for being forced to "ruin," or allowing ourselves to be "cornered" in any modern sense of the term whatever; therefore let us solidly ask ourselves, what can be done to alleviate, or to counterbalance the evils of this wholesale system of nefarious blood-sucking, now practiced so successfully upon the American farmer? The effect of these "corners," even if unsuccessful, is certainly very detrimental to the future as well as the present interests of the whole country, and it is at least an open question, whether the modern commercial and agricultural "corner" does not constitute an offence against the public welfare, which should be put under the ban of the law. So long as the game was confined to operations in stock, and stock confined to its legitimate sphere, the evil effects were not generally felt, but now that every necessary article of daily use, cereals, land and food are becoming the prey of "rings," "syndicates" and "corners," an honest effort should be made to devise some means of preventing or punishing the wrong.

Enough wisdom, born of experience, has come with the thirteen years referred to, so as that it is within the range of clearest demonstration. that Union county phosphate users can save from four to six thousand dollars for the year of 1888, if a full coöperation can be had. Now fellow-farmers, set a pin just here. This method of purchase, use and handling commercial fertilizers is preëminently a practical one in conception and in its results superior in excellence, and when it is stated from this paper that the best-known methods in purchase, use and handling commercial fertilizers for this district of Central Pennsylvania, is by means of the Patrons' Inter-County Phosphate Association; you have the "living truth" confirmed and re-confirmed, in buying, using and handling, from three to five hundred tons annually, since the first year of the last half of the present decade.

So long as the farmers refuse to coöperate, the tendency to abusive agricultural speculation, on the part of all inter-commercial powers is certain; and all its attendant evils will exist to the constant decline of agricultural manhood and nobility. There are those in small numbers who have thoroughly replaced the lone and individual modes with well defined and intelligently fixed coöperative processes, and from such unquestionable and reliable testimony can be had, and in justice ought to be cordially received and confidently acted upon. One should not be charged with partiality in saying these long familiar experiences have established firm and abiding faith for the few, and we cannot but conclude that of the same methods will evolve the same benefits for the many. When this shall become the accepted policy and farmers as a class thereby make coöperative history, no one of the many relations to agricultural commercial benefit will be more prominently written, than that of the department of commercial fertilizers. It is absolutely necessary that means should be adapted to the ends sought and individual effort and sacrifice has always been the price of great good in any reform in any age of the world. The varied experience and experiments consequent upon this philosophy will, in the near future, bring out the leading loyalists of our class, and a paper as imperfectly prepared as are those of to day, will then stimulate to thought and debate. Intellectual, social and financial improvement is being made by the patrons of husbandry throughout our whole country and the world, and in use of this one element of force alone. The business feature of the grange is confidently commended and in buying and selling commercial fertilizers will secure mutual protection and advancement to all farmers. Special virtues, as industry, economy and good management will be the more important and essential when coöperatively practiced, and will very clearly prove to be the more prolific and efficient in their respective functions. To these three virtues, add honesty and integrity in all things, and then as a policy, coöperatively "double and trust" them into the line of farm defense herein indicated, and a most decided degree of success in the purchase, use and handling of commercial fertilizers, or any other praise-worthy and commendable agricultural object can be attained.

BEES AND BEE KEEPING FOR PROFIT AND FOR PLEASURE.

By H. H. BROWN, *Light Street, Pa.*

Apiculture is a branch of agriculture and has so been considered in sacred history for ages. As we find honey and bees spoken of in Holy Writ, that "the land should flow with milk and honey," and scientific men see involved in the life of bees some of the most charming and attractive problems that can possibly engage their attention. Then again we find the honey bee has been the companion of man from the earliest period of history down to the present time. The great question to men of business is the question of profit, especially to those engaged in rural avocations, to those who look only on the surface of things for amusements. Then is presented the spectacle of an insect community organized under a regular government showing various social phenomena which are not the less interesting that they are not fully understood. From ancient history we learn from one philosopher who spent nearly his whole time and thought to bees, for sixty years, and another who spent his time in the woods in order to study them in their natural condition.

How many who pass the busy bee whilst at work on some unassuming flower without once considering the wisdom and goodness of our Heavenly Father in the creation of this little insect—a honey bee. There is none more wonderful in construction or deserving the notice, protection and study of man than this tiny insect of all God's creatures. Were it not for the honey bee man would never have known that honey or nectar existed in flowers as the amount is so small in the majority of the flowers to be discoverable to his senses. But the bee with its wonderful organ, the proboscis or honey gatherer consisting of a bundle of fine and elastic bristles making a perfect brush, which is drawn out to so small a point as to to make the tip scarcely perceptible to the naked eye. With this little instrument by the simple law of capillary attraction she is able to gather the nectar from the flowers; yet the quantity may be so small in each as not to be recognized by either the eye or taste of man. Thus she will visit from flower to flower gathering up with her delicate brush less than one-thousandth part of a drop at a time the luscious honey, and by perseverance, patience and energy she will gather with the assistance of the whole colony hundreds of pounds. Her cells are made in a uniform mechanical order. And her knowledge of her location to which she can return in a direct line after flying from flower to flower, and going over acres of ground to procure her load, this she is enabled to do without chart or compass. Bee keeping can be followed in almost all parts of our land; in fact, I know of but few localities that bees may not be kept with profits. Bee keeping can be started with a very small capital, and as he gains knowledge and skill in the work and study, his bees will increase in number, and he soon be in shape to make the income from his bees pay all the outgo, and leave him an income for profits on his investment. Every honest person when contemplating of entering some one of the business avocations of life generally takes in consideration, will it pay for the money invested. And is it honorable and conducive to health. First, Will money invested in bee keeping pay? I certainly can assure you, for the amount of money invested and the time and attention devoted to it, as it will only require about three months of steady labor during the swarming and honey season, it will pay better than agriculture or many other occupations. There are many localities in the United States that bees have paid one hundred per cent. on capital invested. But in this county I know of no location that the returns would be so large as the flora of this sections is not so freely found that contains nectar in large quantities outside of white clover and buckwheat. Consequently the bee-keeper will have to be content with less surplus.

In twenty years' experience in bee keeping I find twenty pounds of surplus honey on an average from each colony each year will leave a good margin on the investments. The past season I started with thirty good, strong colonies ot Italian bees, worth eighty dollars apiece or in the aggregate two hundred and forty dollars. The average increase during the season is generally one to the old colony, and that would require thirty new hives, worth two dollars a piece or $60, and for sections and foundations to be used during the season would cost $25, or in all $325. The surplus received was 1,400 pounds, 1,100 pounds box honey at fourteen cents = $154, and 300 pounds extracted at eight cents = $24, making a total for honey $178.00; and considering the sixty colonies of bees at five dollars apiece in the fall, that I went in winter quarters with, will make $300. And that will be worth within $25 as much as the first cost of seasons outlay, and the supply of honey which is nearly sixty per cent. on the money invested. The above results will depend on several conditions; first, the location of his apiary in a vicinity where his bees will have access to flora that secretes honey freely, viz: willow, cherry, apple, raspberry, white and Alsike clover, basswood, buckwheat, golden rod, asters and other flowers. Second, the ability and experience of the bee-keeper to do the proper work and at the right time.

The busines of bee-keeping is both honorable and healthy, as we find in its ranks some of the most learned and able men and women, also those who have recovered their health in the apiary. Mrs. E. S. Tupper, of Iowa, says "Health is to be derived from it." The ancient called the honey bee, Deborah, or she who speaketh. Would that its gentle hum might now speak to many women in our land and awaken an interest in a pursuit so interesting and at the same time so profitable. The quick observation and gentle handling so requisite in the business, belongs peculiarly to women, and there is no part of it which is laborious, or that may not be appropriately performed by them. It has proven to me of great benefit, I came west a number of years ago under the sentence of speedy death from one of New England's best physicians, yet now I rejoice in perfect health restored. More than to all other causes, I attribute the change to the interesting occupation which has kept me so much of the time in the open air, and paid me for being there. I most heartily recommend it to others, who are seeking either health or a pleasant and profitable employment."

The pleasures derived from bee-keeping are many and the first pleasure derived from them is, I believe as in all other avocations followed by man, the result of the dollars and cents to be derived from the money and time invested, and then it is a pleasure to the bee-keeper when spring arrives to his little golden beauties come forth and fly away among the flowers to gather the sweet nectar and pollen to replenish their stores. Also who has not seen the bee-keepers contenance brighten when it is announced that the bees are swarming. All will be astir and activity with him and all those who are around at that time.

There is a fever very contagious, but not dangerous in bee keeping called bee fever. And when once contracted it seems almost impossible to get rid of it without deriving considerable pleasure from it. When farmers and others begin to keep bees on business principles, instead of the uncertainties of old dame chance, then will they fully realize that for pleasure, profit and health there is no business in agriculture that can compare to the care of bees.

CAN FARMING BE MADE PROFITABLE?

By J. K. MURRAY, *Pottsgrove, Pa.*

The question of profit and loss in farming is agitating the mind of farmers at the present time to a much greater extent than some years ago, and with a good reason too, as it must be clear to any thinking man that in a majority of cases it will be found unprofitable when the farmer's own labor is fully credited.

This is due to several causes, such as unequal laws relating to taxation, discriminations in favor of concentrated capital and against individual, too much expense in transferring products from the producer to the consumer, etc. But the greatest hindrance to profitable farming, and at the same time the most easily remedied, is the tilling of too much land, and that in too low a state of cultivation.

To show that farming in many cases is carried on at a loss, we append a few figures which are estimated on an average limestone farm. We take a farm that would sell for eighty dollars per acre and a crop of thirty acres in wheat:

Interest on capital, six per cent.,	$144 00
Taxes,	15 00
Insurance, repairs of buildings, fences, etc.,	30 00
Hauling and spreading 120 loads manure,	30 00
Plowing, $3.00 per day,	75 00
Harrowing, rolling and drilling,	45 00
Seed, 45 bushels at $1.00,	45 00
Harvesting, threshing and marketing,	150 00
Making a total of,	$534 00

Farming on this plan gives an average of about fifteen bushels per acre of wheat, or four hundred and fifty bushels, which at eighty-five cents per bushel amounts to $382.50, a loss of $5.05 per acre, or $151.50. These figures may seem large, but if the farm that appears to do better be charged with the over-work of the farmer and his family it will not net so well.

Corn and oats crops yield in about the same proportion to cost of production, and such land will not produce more than one ton to the acre of dry hay from the mow ready for market, which makes the income from fields in grass but little better than the grain, while at the same time the steady cropping with grass tends to reduce the land still more.

It may be urged that the dairy has an opportunity on the grain farm that it has not elsewhere, and will make up in some measure for the loss on the grain fields, but we have taken as our sample a farm on which the busines is not conducted on the most practical plan, and it is but reasonable to suppose that the dairy is alike neglected, and yielding but a small, if any profit.

With the farmer thus losing over five dollars per acre on his grain fields, and being in debt for one-third or more of the cost of his farm, as most farmers are, we must conclude that the average tiller of the soil does not occupy a very desirable position.

Neither is it surprising that every year witnesses the selling out of farmers, who are discouraged with their ill-success and are anxious to try some other occupation, only to meet with disappointment again, from competion or their own lack of knowledge of the business they have undertaken.

In fact, so poorly is the farmer paid in many instances, that the man who works for him by the day can dress himself and family better than his employer.

But agriculture is a calling of too much importance to be allowed to go into decay. It is worthy our greatest efforts to raise it to a standing of honor and profit among the different occupations of men, all of which I believe will be achieved in the near future through the coöperative and educational influence of the farmers' own organization, the Grange.

Having shown that the average farm is run at a loss we will now consider the possibility of raising it to a profitable standing. As before alluded to the farmer need more legislation in relation to taxes, railroad discriminations, etc., evils that are slowly but surely being corrected by the persevering and united labor of the oppressed farmers. Although slow to take hold they never let go until their end is accomplished. They gather knowledge and strength, and each year records some new ground gained.

But as relief through this source comes slowly, the tiller of the soil must have more ready-help. This we find in part by reducing the number of acres tilled and increasing the yield per acre.

It will not be disputed that the interest on capital, insurance, repairs, labor of preparing the soil for the crop, seed, etc., are no higher and taxes but a trifle higher when a farm has been raised to thirty bushels of wheat per acre than when it yielded but fifteen. And as this amounts by our estimate to $13.80 per acre, by far the largest part of the entire cost of a crop, it should become a very important factor in making up the plan for future action. Nor is the cost of cutting, threshing and marketing the maximum crop expensive in the same proportion.

We now consider how to reduce the acreage without material loss. First sell part of the farm or all of it and buy one suited to capital and ability to farm, or allow some of the land to lie in grass, keep more cows to pasture and feed them well; this not only assists in raising the yield of grain to the acre, but becomes a profitable branch of husbandry in itself, as we will endeavor to show in referring to the dairy again. As the increase of crop can only be reached by the use of large quantities of fertilizers, and the supply on the farm being limited, it is therefore necessary to purchase commercial manures, but this requires the direct outlay of money, and thereby causes most farmers to use but little, generally about two hundred pounds per acre, and that frequently only acid phosphate, a quantity far too small to produce a good crop. Instead of two would recommend the use of at least five hundred pounds of some high grade complete fertilizer, when used alone, or three hundred pounds of dissolved rock and potash, with barn-yard manure.

The question may be asked will it pay to use so much fertilizer? Experiments have proven that the farm, like the cow, pays best when well fed.

And when we estimate carefully we see the importance of using a liberal quantity.

We have shown that wheat is raised at a loss of at least five dollars per acre; now all farmers who have used phosphates to any extent, admit that they produce more value in the crop than the cost to purchase.

Variously estimated at from 25 to 200 per cent. to be safe, we will take 100 per cent. for profit, it would therefore be necessary to use over five dollars worth to the acre to come out square, as this investment would give us about ten dollars worth of grain. And as the fertilizer is not exhausted in one crop it will be safe to spend seven or eight dollars on each acre. The plant food that is becoming available after the first crop is taken off will produce two or three good hay crops, which, if fed on the farm, not only keep up the fertility of the soil but help to furnish a greater profit on the money invested in fertilizer.

If this seems like expensive manuring it is only necessary to compare with that common method of buying stable manure in town and carting to the farm at a cost delivered, of about two dollars and fifty cents per load, and eight loads to the acre; the usual amount costs twenty dollars, and will not produce as much wheat or corn as five hundred pounds commercial manure, costing seven dollars and fifty cents.

However in thus comparing manures I would not be understood as ignoring barn-yard manure but would recommend the increasing the quantity and quality to the greatest possible extent and supplementing with phosphates in above liberal manner.

Although the foregoing is a little beyond my own practice still my experience is such as to give reasonable proof that the theory is correct, and in further support of which I would quote from the experiments of the Hon. John W. Hickman, as follows, first a case in which he furnished the fertilizer four hundred pounds per acre for wheat at forty-two dollars per ton and took the increase in the crop for pay, the result was $99.97 per ton for the fertilizer, an other case on same terms, he furnished six hundred pounds to the acre and thirty-one acres corn net profit of one hundred and forty-one dollars.

In both cases only one crop was considered although the soil must have been left in a much more fertile condition.

Nor is this the only reason that a large quantity of fertilizer should be used at one time, there are seasons when but a small quantity of rain falls during the seeding time and at such times phosphate drilled with the wheat, sometimes injures the roots and retards the growth of the crop.

While if the soil has been well supplied with plant food before the crop was sown a vigorous growth is the result from the start, which greatly helps a crop through a bad season. To this end I think it more certain to drill the fertilizer in two weeks or more before the crop, in which case the grain does not come in direct contact with the fertilizer, and yet the available plant food is within easy reach of the roots as they penetrate the soil.

Although we claim that grain can be raised with profit as a special business on land that is in a high state of cultivation, yet it is not necessary to depend upon the production of wheat and corn for sale only. As no farmer should think of trying to raise grain without feeding cattle, during the winter at least, for the purpose of making manure. The plan of buying steers in the fall to feed and sell in the spring is a good way to increase the manure pile and usually nets some profit in the cattle, is attended with less labor than the dairy and can be closed out when farm work accumulates upon the farmers' hands.

But where the necessary help can be procured the dairy, in our estimation, pays much better, and it can be very conveniently connected with grain raising when the latter is conducted upon the plan herein suggested. In fact the dairy cannot be brought to its greatest degree of success separate from the grain farm. A large amount of straw is necessary about the stables, there is a great deal of coarse feed such as pumpkins, unripe corn, corn fodder, etc., that cannot be sold to advantage but which make excellent food for cows. Then a large portion of the profit of the business comes through the use of the rich grain feed manure on the grainfields. Sufficient in our opinion with the skim milk for pigs to pay for the hay and the labor, leaving only the grain fed to be paid out of the sale of butter, and with the improved methods of handling and caring for the milk and cream the labor is greatly reduced.

After several years' experience in feeding beef cattle I found the average net profit to be about twenty per cent. on market price of grain fed.

While a careful summing up of the dairy business for the past two years shows the net profit over seventy-five per cent. and the manure heap no less valuable. Of course I recommend strong feeding of the cow as well as the farm as it pays better. The orchard and the truck patch can also be attached to small farms with profit.

In summing up would say let the farmer undertake no more than he can properly superintend, let him reduce the acerage one-third, give proper attention to the dairy, the hen house, the potato path, and spend each year for fertilizer a sum equal to that now paid the holder of some mortgage as interest on land he does not own, there will be less complaint about farming being a poor business.

THE FARMER'S RIGHTS AND DUTIES.

By Dr. James Calder, *Harrisburg, Pa.*

In recent years a great change has taken place in the attitude of farmers before the public. It will hardly be denied that formerly they were as a class, less esteemed than any other great body of our people; and that the consideration of their rights and the advancement of their peculiar interests received but little public attention. Though numerous, their numbers were considered in swelling the majorities for candidates chosen from other callings rather than in deciding their own claims for political representation; and because they were the owners of the bulk of real estate in the country the unenviable distinction was accorded them of paying taxes enough to support a government for themselves and for the owners of all other kinds of property.

Little was granted them out of the general good enjoyed by the people; and no one seemed to think they had necessities, as have other classes, which merit attention, and the reasonable care for which would rebound to the public welfare.

In thus speaking I do not intimate that farmers should have special privileges and honors, nor do I claim for them exemptions and considerations which, under similar circumstances, are not freely granted to all other citizens. All that I assume is that in this country agriculturists form a class whose importance is second to no other, and that to have importance justly recognized and duly advanced may be reasonably asked of the representatives of all other classes and interests.

As the organization which called us together on this occasion is composed of farmers, and was formed for the sole purpose of developing the science and improving the art of agriculture in Pennsylvania, I judge that it is in place to consider here any matters which affect the farmer, and which shape the results of his labor as they influence the community at large. It is but just that so large a class of our citizens as those who occupy farms, and toil so unremittingly for the Nation's support, should have due credit for that which they do. It is desirable that they should be developed intellectually, and elevated socially and morally; and, in return, we must admit that they should be required to do all they can for the public welfare and to enhance the National character in the estimation of the world.

Farmers have a right to receive from the community at large, due credit for their worth and their works. It has been too much the custom to make them, indiscriminately, objects of ridicule. The mere fact that a man lives in the country and earns a living by tilling the soil, seems to be proof positive to some people that he is an ignoramus, or a slightly deficient person. He is regarded as destitute of fine feelings, and incapable of gentlemanly conduct. His critics see nothing noble in his calling, and to them there is not enough in it of usefulness to save him from their contempt.

Does not truth declare that beneath the homespun jacket there oftener beats an honest heart than is found covered by the garments which distinguish envied classes? Does due concession of usefulness to other callings forbid the claim of preëminent usefulness for that of the farmer? How true is it in every sense, and looking steadily in every direction in succession as we speak, that the work performed on the farm is the foundation industry! Surely those who prosecute it successfully have a right to the good opinion of their fellow-citizens, and to the occasional ungrudged utterance of acknowledgments and commendations.

Farmers have, also, a right to full equality before the law with any of their countrymen. The nature of their possessions makes the bulk of their wealth visible to all men, but that is not sufficient reason why they should be burdened with taxes from which their fellow-citizens of equal, and even greater wealth, are excused. Pennsylvania farmers have suffered long from this unjust inequality, and now that attention has been called to it in the halls of legislation, we see a tardiness in redressing the wrong which plainly asserts that farmers are not and shall not be equal before the law with other property owners.

Adherents of all political parties in our State demand governmental protection for all industries carried on in our borders—except agriculture. But why except the chief industry? If we protect the manufacturer against the ruinous rivalry of foreigners, why should we admit foreign raw materials free, and thus prefer the alien to the Amercan farmer? Wherefore is the farmer's right to protection so much less than that of other classes?

It is generally admitted that our Government may legally and profitably detail officers and appropriate funds to investigate scientific and industrial questions, and aid in the acquisition and dissemination of useful information. In the past much good has in this way been done, some of it in directions which greatly benefit our agriculturists. But the aid thus afforded to our chief industry has not been a tithe of that which should have been given, and by incompleteness, and the incompetency of officials whose claim to position was devotion to partisan politics, has often failed to bring the benefit anticipated. It cannot be denied that in a country possessing millions of unoccupied acres, and in which agriculture is called upon to feed millions of workmen, and to supply much of the raw materials upon which their industry is exerted, it is sound policy and an obvious duty to give that calling not only protection but also aid that will secure development and improvement

Another right which, practically, is denied to farmers, is that of admission to positions in our State and National Governments. The great agricultural interests of our country need representation in the halls of legislation, and no persons can so well present their claims as those whose life-work it is to attend to them. No other interest has so few representatives in our law-making bodies, in proportion to its numerical strength, as agriculture, and as a consequence of this disbarment, we see it discriminated against and made to suffer wrongs by unfair enactments. If eligibility to official station is a stimulus to healthful ambition, and an incentive to self-respect and self-improvement, then the right of the farmer to such advancement should be in no way denied; for his enemies being his judges, no other citizen needs so much to be intellectually and socially elevated.

In this rapid glance at some of the rights of farmers which, in our opinion, are not generally accorded to them, we have not spoken in ignorance of, much less in denial of, the corresponding duties which they owe to their fellow-citizens of other callings, and to the community at large. We deny that the pursuit of agriculture makes any man a privileged person; nay, on the other hand, looking on the tilling of the soil as the occupation which has the peculiar appointment and approval of Heaven, we concede that from those to whom so much has been given much should be required in return. We believe that farmers owe much to their fellow-men, and we do not regard him as an enemy who reminds them of their obligations, and holds them to the performance of them.

Much is said of the disadvantages which beset the farmer, arising from his location and his labors. These should be remembered when anyone charges him with want of culture, or any mental, moral or social deficiency. But it is his duty to "make the most of himself" by wisely improving the opportunities which in his situation are available. And it is herein that most practical agriculturists deserve censure. They neglect self improvement. They underestimate the value of a thorough education. To a degree which is surprising and unreasonable they follow the manners and methods of their fathers. The science of agriculture is almost unknown to thousands whose only occupation is tilling the soil, and those thousands show but little better acquaintance with agriculture as an art. Herein they neglect a plain duty, and in so doing fall short of the obligation that rests upon them as members of society.

As citizens of a republic, as fully empowered as the members of any other class to shape and control public affairs, farmers have a duty to perform which cannot be discharged without a large share of that which may be called public spirit. But how many of them manifest enough of that important element of a freemen's character to attract attention? So little of it do they have that, though they are the most numerous class among our people, they have less influence than any other in molding public opinion and directing public affairs.

There is another duty which they neglect, and by so doing greatly wrong themselves and, indirectly, injure society at large. I refer to their failure to cultivate and maintain a distinct class feeling. All those who pursue other avocations surpass farmers in this particular. Mechanics and professional men, merchants and common carriers, and people of all other callings, have perceived the necessity of uniting for the assertion of their rights, the development of their business, the redress of wrongs, and the profitable prosecution of their occupations. Their class feeling brings them close to each other, and the hostile hand which touches one awakes resentment in the breast of every member. But how great is the contrast which in this particular is presented by farmers! A few farmers' clubs, short-lived and very local; four hundred granges in the great State of Pennsylvania, none of which are fully utilized by the farmers in their neighborhood; a State Agricultural Society, which does not reach the mass of farmers, and is unknown by them; a State Board of Agriculture, which aims to unite and help all husbandmen, but finds among them its most scornful critics and bitter opponents, these are the meagre fruits of the class spirit among our farmers, the litttle used agencies for the maintenance and spread of that element which is so essential to success.

The necessities and duties of farmers require that they shall organize. They must unite for the defense of their rights and the redress of wrongs. They must meet regularly and often for the interchange of views, the discussion of principles and methods, the reports of experiments, and the narration of experiences. They must be patrons of the press, contributors to and readers of its issues. Avoiding partisan affiliations as a class, they must show an intelligent interest in local politics, particularly in their bearing upon schools and roads, and then so throw the weight of their influence at all general elections as to put into office only those men who will recognize and favor the reasonable claims of agriculture.

Too long have farmers stood as if destitute of principles, spirit, rights and public duties. The time has fully come in which they must arise and prove their desire and purpose to live. They must be men among men—citizens of the republic who are conscious of their own worth and responsibilities, and yielding to none in respect for and earnestness in elevating their calling, which is the most ancient and honorable known among men.

ADVANTAGES OF THE EDUCATED FARMER.

By JOHN W. HARBESON, *Lebanon*, *Pa.*]

Personal observation prompted me to select for my theme, "The Advantages of the Educated Farmer," for I have full reason to believe that all within the range of my voice will agree with me that under like physical circumstances, the advantage in all trades and occupations, is invariably and always with the educated man. Experience which is a severe taskmaster, proves this assertion every day in the week.

There is, in my opinion, no more honorable calling in the land than that of the farmer, and his life, I assert without fear of contradiction, is rendered doubly happy if he possesses the almost indispensable benefit of a cultured mind. We are told by one of the wisest of censors that "comparisons are odious," but you will pardon me I trust, in declaring such sophistry out of order for the present at least, and giving expression of what may have come under my personal observation in favor of the educated farmer, who as it were, lives in all the dignity of baronial ease, his shrine blessed with peace and plenty.

We all know that such a farmer reads the papers and periodicals of the day and keeps himself posted as to the state of the market at all times of the year. He is timely advised as to the movements of sharpers and swindlers who make it a practice to prey upon the easy, unsuspecting ways of the farmer, by which he is frequently made the victim of misplaced confidence. There is not a person present to-day who does not recollect the delusion and snare by which farmers, whose school days were sadly neglected, have not incurred aggravating losses by signing questionable papers. Their lot is made miserable by doing that which they should not do under any circumstances were they properly informed, so that they could guard themselves against "ways that are dark and tricks that are vain." But the very fact that the average farmer is honest makes him all the more liable to be selected as a victim by the knaves that are constantly on the alert for ill-gotten gain. It is true too that some farmers will not even learn wisdom from experience, nor heed advice kindly given by the most trusted friends. They refuse to take a county paper, and much less an agricultural journal, whereby they can inform themselves that the world moves, by reading up the news of the day and getting valuable information as to the most practicable methods in farming. There are, let me add, some honorable exceptions in this respect, and the day is dawning when the daily and weekly paper and some choice agricultural journal are no longer looked upon as false economy in the farmer's household. Well may we rejoice indeed over this inproved condition of affairs.

Show me, my friends, wherein the educated farmer has not the advantage. He is well informed as to the crops, present and prospective, and governs himself accordingly in forming prices. He is not obliged to rely upon others to keep up with the fluctuations in the market. He reads the popular agricultural journals of the day and the inprovements in his stock and machinery give unmistakable evidence that he reads understandingly and puts into practice that which he considers the most feasible and profitable. Go to the fields and take a look at this farmer's cereals and stock, and you will be in wonder land for the time being. His cattle look "pretty as a picture," and all because he departed from the ways of his grandfather by putting the "scrub" out of the way, to make room for the fine-blooded stock which he secured from responsible dealers through the medium of his farm journals. Even the barn will be an index as to the character of the farmer. There too you will find convenience and taste displayed, and where the farmer that seldom reads is content to worry and tug along in the old rut, the intelligent and enterprising farmer will overcome time and labor by having labor-saving machinery, save his men from being overworked. The contrast in this respect is so great, that public opinion will invariably be on the side of the educated farmer, first, last and all the time.

I could draw any number of comparisons conclusively proving that the advantage is in all respects with the educated farmer, but it is not my desire to weary you. I will add, however, that the educated farmer is in the lead all the time; that he will be found a progressive friend of the great cause of popular education and an honored and efficient member of the school board of his district; that he will not object to donating a suitable site for the erection of a school house on his farm; that he will approve of the Pennsylvania State College of Agriculture, and encourage its noble mission in its indefatigable efforts to elevate the farming interests of our grand old Commonwealth, the Keystone of the federal arch.

But we can go further, all the surroundings of the farm, including the waving fields of grain and the luscious fruit, give unerring evidence of the educated farmer. It were a pleasure indeed to dilate on this subject, but we will now make a passing note of that other important auxiliary to the farmer's success and comfort—the improved machinery. You will find none but the best, because he took ample time to book himself on the most approved machinery that stood the severest test by honest competition. He will consider the harvesting of the crops a pleasure, because there will be but little friction between his laborers and the machinery. Everything moves with the precision of clock work, and when the crops are housed, the same will be done with the machinery instead of allowing it to be exposed to the weather, and rendering it almost unfit for subsequent use. At the proper time the thresher and separator are placed in position, and it will be no disagreeable work to thresh the grain and hold it for market. When the farmer finds it profitable to dispose of his produce, he will ship it to market and as a result of his labor can sit among the family circle with a surplus that will be under his own immediate control, and, I may add, very deservedly so.

Some of my hearers may think I am overdrawing this picture, but you will remember that my paper is open for discussion. But I am not done with the advantages of the educated farmer, go with me to his home and behold the beautiful yard studded with greens, shrubbery and beautiful flowers, and you will exclaim with me that "a thing of beauty is a joy forever." How did this farmer become possessed of so much taste, it may be wondered, and we will simply put the refrain whether any one would for a moment suppose that an illiterate worldly man would take an interest in cultivating "the good, the true, and the beautiful," to such a degree?

Now go with me to the house and you will find that the educated farmer lives for comfort, and that instead of occupying a bleak, rickety apology for a house, he resides in a stately mansion, surrounded by all the comforts that make life's voyage a delight. His table abounds with a bountiful supply of fresh products, provided by his own industry, and presents at all times the most inviting appearance. The rooms are beautifully furnished and ventilated; handsome pictures and bric-a-brac adorn the walls, and let me assure you a well-selected library will be found in that happy home. Contrast in your own mind this lovely home with that of an illiterate man of the world, and draw your own inference.

But laying aside all comparisons, we owe much indeed to the sturdy, industrious farmer, through him the primeval forest has given way to cultivated fields, to smiling villages, to flourishing cities and beautiful farms, fair and mellow as a garden, dotting every valley. The howling wilderness which once enwrapped this fair land has been made to bloom and blossom as the rose; to swarm with a prosperous and happy people drawn together from the four quarters of the globe, the surplus of whose immense agricultural products goes far to supply the world and augment the general wealth of the whole country.

And now, our country seated in the forum of nations, can proudly boast her oceans of cereals—their waves swelling and rolling in golden glory over an imperial tract, larger in extent and more fruitful in life sustaining products than the principal nations of the old world. And why this onward march of our blessed land? Let learning reply from many a hall dedicated to the muse of classic love. With a history crowded with high resolves and noble deeds; with a population virtuous, intelligent and brave; with colleges, seminaries and free schools flashing their intellectual fires from every hill-top; with revealed religion shedding its serene influence over the rich and the poor—there is abundant hope that the educated farmer will go on "conquering and to conquer," and continue to add fresh laurels to an occupation hallowed by the most pleasant associations.

THE APPLICATION OF GEOLOGY TO AGRICULTURE.

By HON. ISAAC R. HOFFER, *Lebanon, Pa.*

The application of geology to agriculture is a subject which has heretofore received but little if any attention, and whether it can be practically applied is a question which time must determine. I am satisfied that a knowledge of geology is a great help in determining the character of a soil, and I cannot see why it should not be of practical advantage to the agriculturist in the selection of land either for general cultivation or for special crops.

How to present this subject so that it can be understood by those who have no knowledge of geology is the difficult problem. I can see no better way than to briefly outline some of the general features of geology, with reference to localities in this State, and, by showing the relation of geological formations to the soil, point out how a knowledge of geology can be applied to agriculture.

The general historical divisions of geology are periods of time, named from the older to the newer as follows: Archæan, Paleozoic, Mesozoic and Cenozoic. These general divisions of time are divided into ages, as for instance, Paleozoic time is divided into three ages, the age of invertebrates, the age of fishes, and the age of coal plants; and these are again sub-divided into periods and epochs under various names and designations. These sub-divisions are intended to show the character of the different formations; and I shall refer to these as formations, and to the general divisions as periods.

The Archæan period is divided into two general formations—the Laurentian and Huronian—and from these most of the succeeding formations are supposed to have been formed.

Philadelphia, Delaware and part of Bucks, Chester, Lancaster and York counties are of these formations, and the Durham or Lehigh Mountains, through Northampton, Lehigh and Berks counties, and the South Mountain through Cumberland, Franklin and Adams counties belong to these formations. The soil in these formations is extremely varied, both in texture and fertility, depending on the character of the rocks and their mineral constituents from which the soil is formed. The rocks with few exceptions are highly crystallized, and their beds stand at all angles, owing to the uplifting and flexing which they have undergone.

The leading rocks are granite, gneiss, syenite, and limestone, and micaceous, talcose, and cloritic slates and shales. The common mineral ingredients of these rocks are quartz, feldspars of different kinds, mica, hornblende, pyroxene, talc, epidote, clorite, serpentine, etc.

The rocks are generally aggregates of two or more minerals, and the proportions vary indefinitely, so that they often imperceptibly graduate into each other. It will thus be seen that the soil, both in texture and fertility, must greatly vary where so many different kind of minerals enter into its composition. The texture of the soil is, however, more dependent upon the fragmental character than upon the mineral character of the rocks that enter into it. Quartz and other hard and insoluble rocks make a sandy and gravelly soil, while the soluble rocks make a soft and clayey one. The texture of the soil is easily determined, whether it is sandy or clayey, or a sandy loam or a clayey loam by its appearance, or by the touch.

Feldspar enters largely into the rocks of these formations and furnishes some important elements of fertility. There are five kinds of typical fieldspars, an analysis of which, with the analysis of some of the other mineral ingredients that enter into the rocks of this formation are as follows:

	Silica.	Alumina	Lime.	Magnesia.	Potash	Soda.	Water, iron and other minerals.
Potash Feldspar,	65.	18.			17.		
Soda "	68.	20.				12.	
Soda-lime "	62.	24.	5.			9.	
Lime-soda "	53.	30.	13.			4.	
Lime "	43.	37.	20.				
Hornblende,	45.	38.			11.		6.
Pyroxene,	55.		23.5	16.5			5.
Epidote,	37.8	22.6	23.8				16.3
Micovite (common mica),	46.3	36.8			9.2		6.7
Daumorite (hydro-mica slate),	45.	38.			11.		6.
Chlorite Slate,	38.9	14.8		34.6			11.7
Steatite (soapstone),	62.8			33.5			3.7
Serpentine,	43.48			43.48			13.04

Apatite: Phosphorus protoxide, 40.92; Lime, 53.80; Chlorine, 6.82.

The feldspar crystals can be distinguished from the quartz by their softness; they admit of being scratched with a knife while quartz do not. The potash feldspar is distinguished from the others by the square shape of its crystals. It does not decompose as readily as the others, and therefore forms the higher and more rocky portions of land. Where the other feldspars prevail the soil is generally deeper and the surface less rocky. The soil formed from the feldspars is of a greyish color, and except where the lime feldspar prevails, of a sandy quartz ore character, where this soil is mixed with decomposed hornblende, epidote, or pyroxene it has a reddish appearance; and if of proper texture is among the most fertile in these formations. The Durham or Lehigh Mountains, especially in the neighborhood of Shimersville and Zionsville, Lehigh county, show these formations with all their various minerals to the best advantage of any locality in the State.

The micaceous, chloritic and slaty portions of these formations are, probably, exposed to the best advantage in Chester and Delaware counties.

Common mica contains 9.2 per cent. of potash, hydro-mica slate 11 per cent., and hornblende 11 per cent. Epidote and pyroxene contain each 23 per cent. of lime, while quartz, chlorite slate, soapstone, and serpentine contain no fertilizing minerals. Add to these the feldspars and crystalline lime, and you have nearly all the mineral constituents of the soil of the Archæan region of Pennsylvania; and you can readily see why some portions of that section of country have naturally a good soil, while in other portions it is naturally poor, for the texture of the soil, and the mineral character of the rocks from which it is formed, determine its quality for agricultural purposes. You can understand too why a man with some know ledge of geology can go into a country of that kind and select the better soil, or the soil especially suited for certain plants, if he knows what mineral food the plants need.

The No. 1 or lower formation of the Paleozoic period, called by Dana Primordal or Cambrian, is composed of three sub-divisions in this State, of which the Potsdam sandstone is the leading and distinguishing part.

This formation generally skirts the borders of the Archæan, and its upper sub-division is the source of the brown hematite iron ores in the eastern part of the State. Chester, Lancaster, Berks, Lehigh, Cumberland and York counties contain nearly the whole of this formation, and the soil is generally poor except where it interlaps with other formations.

No. 2 of the Paleozoic period, in connection with part of No. 3, makes up the great limestone formation of this State, among which are the Lancaster limestone basin, the great Kittatinny valley, which includes the valleys of Lehigh, Lebanon and Cumberland, and other limestone valleys in York, Adams, Fulton, Bedford, Blair, Centre, Huntingdon, Mifflin, Clinton and Lycoming counties. The lower subdivision of this limestone formation is calciferous sandrock, generally coarse-grained and rough, containing enough lime to effervesce with acid. The balance of the formation is limestone of various colors from white to dark blue, and graduates in its upper portions into No. 3 slates. The soil of this formation is almost universally good in this State; even where it is a heavy clay the contorted and cavernous rocks effectually drain the soil so that it produces good crops. There is, however, a great difference in the richness of the soil in this formation. Where it adjoins No. 1 and is interstratified with its slates, or its sandy and ochery shales, as it is along the Lehigh Mountain in Lehigh and Berks counties, and along the South Mountain in Cumberland county, there the soil is generally deepest and richest. In Lebanon county, at the foot of the Millbach Hill and westward along the Cornwall Hills, is a remarkable fine exposure of the interlapping of the slates and ochery shales of No. 1, with the lower limestone of No. 2; and no soil in the county compares in fertility with that of this region. The slates and shales, I think, belong to the hydro-mica series, some of which, as I have stated, contain 11 per cent of potash, and it must be the mineral ingredients of these shales, in connection with the lime, that makes the soil so unusually rich.

The interstratification and intermixture of slates and shales with the limestone causes the limestone more readily to disintegrate; and at every plowing the little particles of rock exposed to the air seem to disintegrate and again replenish the fertility of the soil.

The calciferous sandstone is very little exposed in this State as a rock, but where the soil is sandy and quartzose it is in most cases the remains of decomposed calciferous sandrock. This soil is generally good and easily improved, except where it is all sand and quartz.

Where the limestone come too near the surface, or where they lie nearly flat with the heavy clay on top of only a few feet thick, the soil is not easy of cultivation and not very productive. Where the limestone approaches the No. 3 slates, and interlaps with them, the soil generally becomes very clayey and is not as good, although some of the most beautiful farms are in this particular range.

The No. 3 slates, except where they are sandy or contain considerable lime make a poor soil.

There are ten more formations with their sub-divisions, reaching to the top of the coal formations, belonging to the Paleozoic period. These formations consist of sandstone, limestone and clay slate, and their various intermixtures, with few special minerals of advantage to agriculture; and nearly all these formations contain each these three classes of rocks. The soil that contains either too much silica or too much clay is naturally poor and difficult to improve, but where the proper proportions of silica and clay are united and the soil is deep enough, it may be readily improved although naturally poor.

The better soil throughout these formations is formed where the limestone prevails, or where lime is mixed or interlaminated with sandy slates in such condition that it is easily disintegrated so as to form a deep soil of sandy loam. Some of the coal formations, especially in the upper bituminous regions, are composed of such calcareous shales, or of layers of slate and limestone with seams of coal, all of an easily disintegrating character, which must make a good soil. Washington county is a locality where this kind of formation prevails, and furnishes an example of the kind of soil it produces.

The soil formed by the different formations of the Mesozoic period is generally rather poor, although in some localities it is a deep sandy or clayey loam of more than average fertility, and capable of the highest state of cultivation. The texture of the soil, its depth and the rocks from which it is formed are the guides by which its quality can be determined.

The Cenozoic period includes the drift and alluvial formations, and geology is not of much advantage in determining the character of the soil, except where the source of the deposit can be ascertained, and even then recent alluvial deposits generally contain so much organic matter that the soil is rich regardless of what the rock constituents were. There are, however, soils made from washings that are very poor, but these are generally sand, clay or pebbles that show their barren nature.

There are many localities where the general character of formations has been changed by igneous action, and almost universally rendered more fertile. The trap regions of the Mesozoic period in Bucks, Montgomery, Berks, Lancaster, Lebanon, Dauphin, York and Adams counties, locally known as "ironstone land," are the most noticeable examples of such action. The soil formed from the eruptive matter is generally good, but in most places too rocky for cultivation. Where the heat extended beyond the eruptive matter, the soil formed from rocks that were heated is nearly always richer than in the unaffected portion of the same formation, and is easily distinguished by its darker color or more sandy or gravelly character.

A remarkable case of extended change by heat in the character of the rock outside of the eruptive matter of the trap dike is well exposed in this (Lebanon) county. On both sides of the trap ridge, running nearly east and west through a portion of this county, the No. 3 slates are in many places, for a distance of over a mile, transformed into sandstone composed of granulated grains of sand. This transformation was no doubt the effect of igneous and aqueous actions somewhat similar to the process of making sand out of the furnace slag by running it, in a fused state, into water where it instantly granulated into a coarse gritty sand.

There are other local peculiarities in the different formations which affect the natural fertility of the soil and its adaptability for agricultural purposes, but I can, in this paper, only refer to one instance of a marked character of this kind. The locality is in the great Lancaster limestone basin, between the city of Lancaster and the Susquehanna river, and includes parts of Manor and several other townships. The soil is of a sandy loam, of a dark—almost black—color, is deep, loose, and easily cultivated and never clods.

The underlying rocks are a dark-blue limestone with intermediate strata of easily disintegrating micaceous and plumbaginous slates and black, sandy shales. The soil of this formation has the greatest natural resources of fertility of any soil I have ever seen, and for all kinds of crops its productiveness, under its present state of cultivation surpasses the richest alluvial deposits.

In this particular case, as in all other cases, the mineral constituents of the soil were simply the mineral constituents of the rocks from which the soil was formed.

This shows how important it is for the agriculturist to know something of the rock formations and their mineral constituents of which the soil is composed.

A soil may be productive from the organic substances contained in it, or may have been made productive by judicious cultivation, but if it has no *mineral resources of fertility* its productiveness will soon be exhausted. In the selection of land it is a great advantage to be able to ascertain the mineral resources of its fertility; and it is equally advantageous to understand the natural adaptability of a soil for the cultivation of particular crops. This, however, requires a knowledge of what the plant wants as well as what the soil contains, but if the constituents of the soil are known there is no difficulty in finding out what plants will best grow in it, for there are plenty of publications to give information on this point. The only way to ascertain the mineral resources of fertility in a soil, or its mineral character is by ascertaining the constituents of the rock formations from which the soil is formed; and to do this some knowledge of geology is necessary. This should not discourage a single farmer who is willing to make a little effort to learn, for geology, in this State, has been brought into such a shape that by looking at the maps of the Geological Atlas of Counties, issued by the State, the location of the different formations in each county can be seen at a glance. With this Atlas as a guide the farmer will be able to see in what formation the land lays he wishes to examine. He can then refer to that formation in Dana's Geology (the school edition will do) and see of what minerals the rocks are composed, and by a little study of the rocks he will be able to distinguish them from others; and by continuing in this way he can soon get a fair knowledge of geology. With Dana's Manual of Mineralogy (school edition) he can find the constituents of every mineral he meets, and he will soon have all the information necessary to ascertain the natural or mineral character of any soil he wishes to examine.

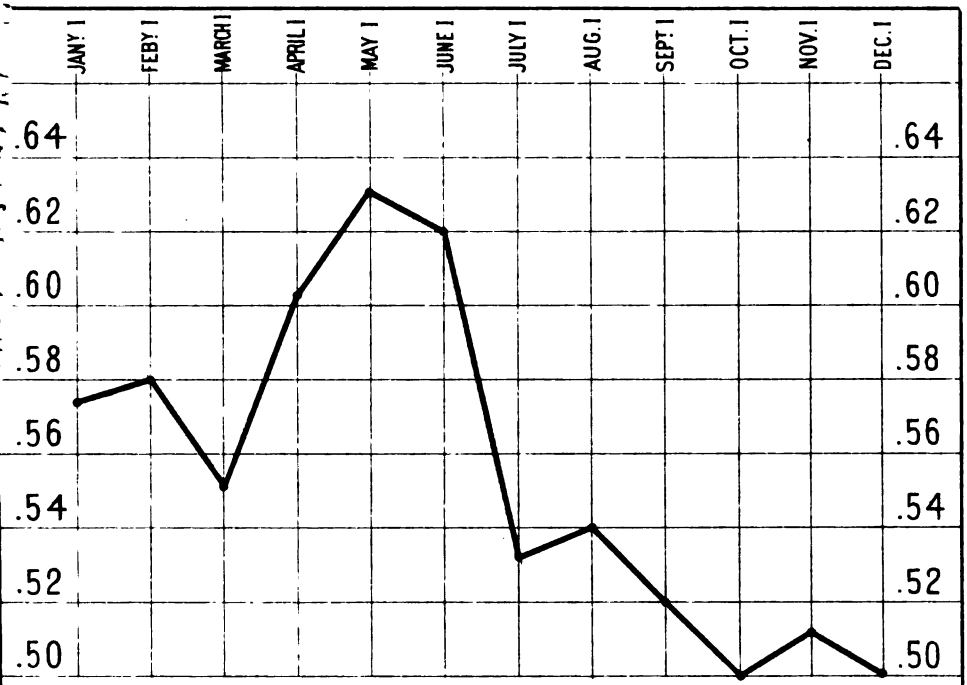
INFLUENCE OF FAIRS ON EDUCATION.

Prof. Cyrus Boger, *Lebanon, Pa.*

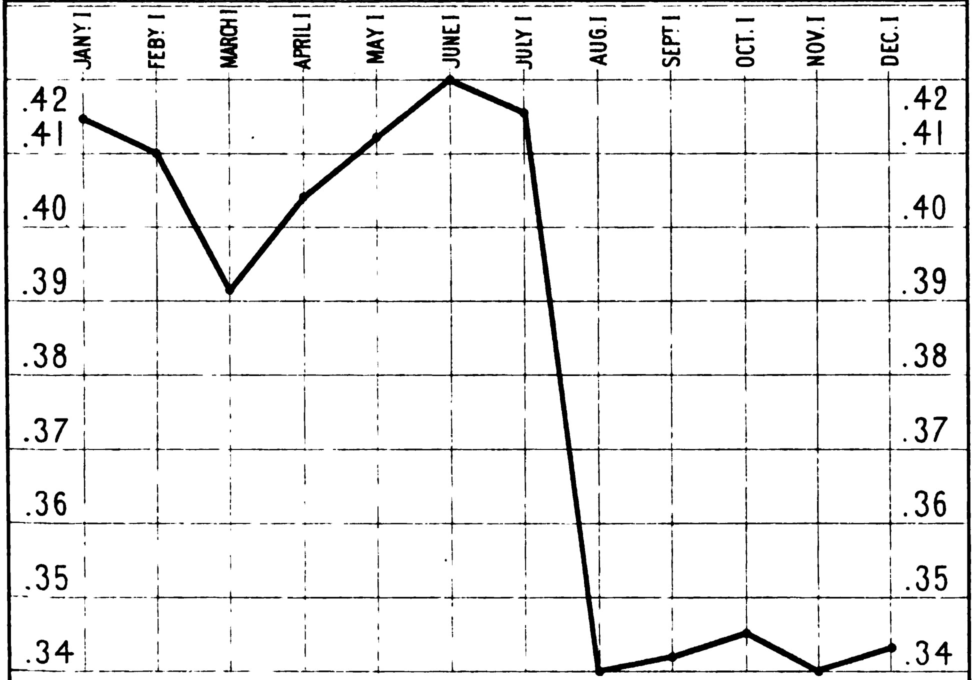
Public exhibits for market or display are common to all ages of history. The Greeks had their Olympian, Pythian and Nemean games. The Romans had one of the most magnificent buildings, the circus maximus, for all kinds of public exhibitions. The middle ages had their tournaments and jousts. Modern European countries have their great fairs.

In their character and purpose these exhibitions may differ widely. The Olympics exhibited all that was best in the life of the Greek. The exhibitor and the contestant must be Greek, but the performers in the vast arena of the circus maximus were mostly barbarians and often wild beasts; and the audience were there only for amusement. Men like Cicero and Cæsar did not attend them. The knights of the middle ages in their contests sought to win only the admiration of the ladies, while the fairs of modern Europe are defined as a great species of market. In America the word fair seems to have lost completely its Old World meaning. Here we apply it almost exclusively to industrial exhibitions. The word "fair" has its origin in the Latin [illegible].

Their influence for good or evil of course depends on their nature. How much the greatness of the character of the Greeks in the zenith of their glory depended on these national festivals, history testifies. And how much the inhuman, gory, gladiatorial combats of the Romans helped to degrade their national character we may conclude from the bull fights of Spain, which were their natural outgrowth. Probably no institution exercised a greater influence in moulding the national character and producing that noble type of physical and intellectual beauty which we see reflected in Greek art and literature than their public contests. For them each youth was trained in the



Prices of corn - 1888



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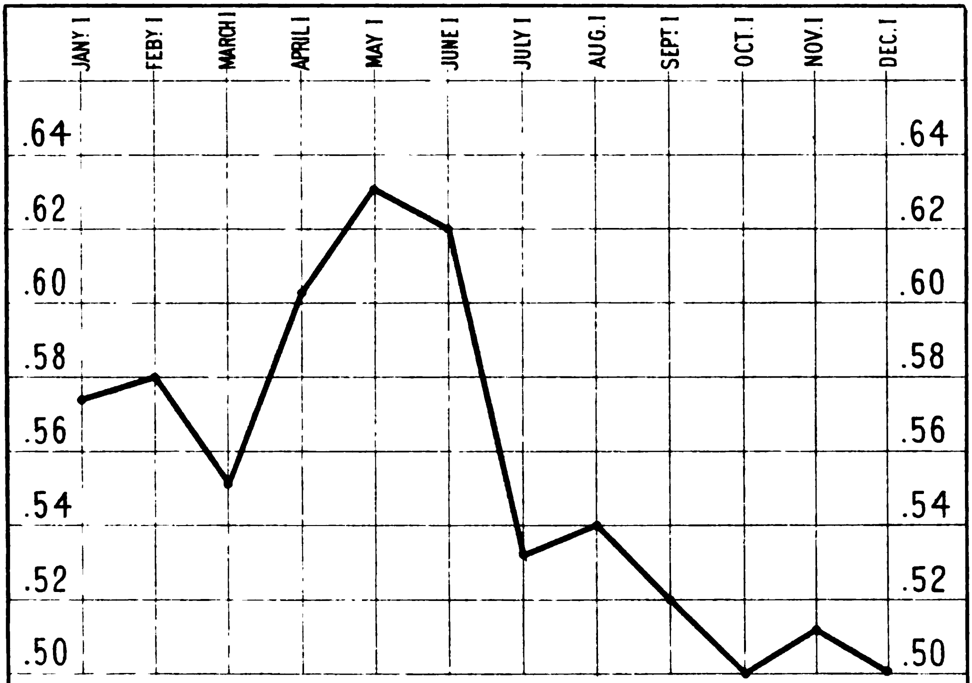

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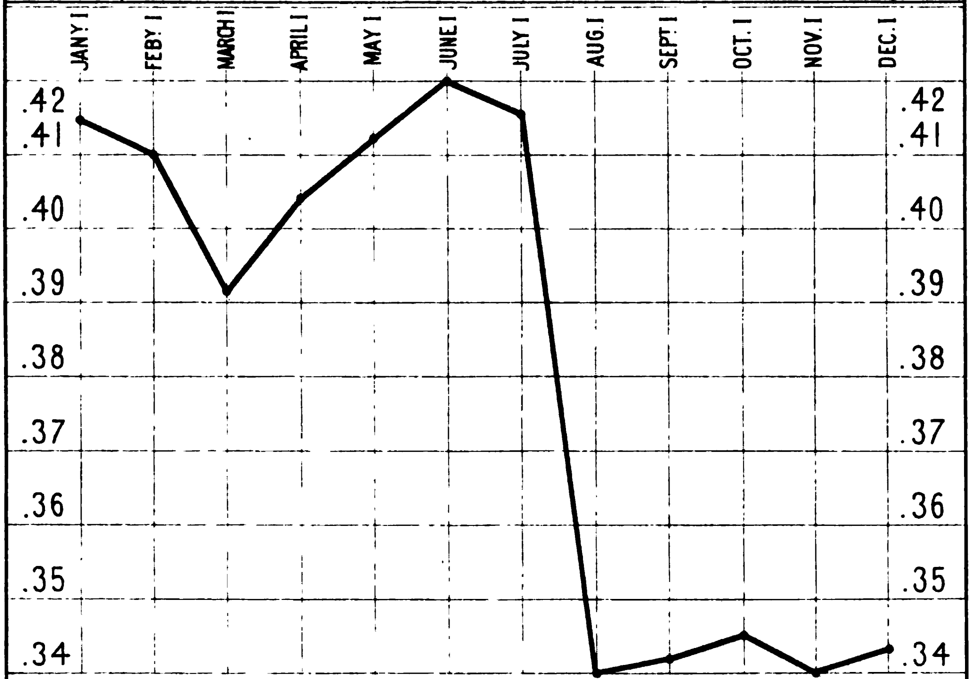


Prices of oats - 1888.

gymnasium; they were the central mart whither poet and artist and merchant, each brought his peculiar wares. They were the common ground of union for every member of the Hellenic race.

Greek education was not one-sided; it embraced the three fold nature of man—body, soul and spirit.

For the body they had athletic games; for the mind music, in their sense of the word; and for the spirit they united religion with all their festivals and games.

Their contests in music required training in whatever pertained to the cultivation of the mind, and they were regarded as among the most valuable means of intellectual improvement. By them the love of glory was stimulated, and they became the moving spring of the most intense efforts. They exerted the greater influence from the fact of being connected with those great national and religious gatherings—the Olympian festivals. Here poets and historians read their productions to admiring audiences; painters and sculptors exhibited their skill of brush and chisel. Herodotus and Thucydides, Apelles and Proxiteles used these occasions to reap the reward of their greatest efforts. The good influence of our country fairs, up to the present, has been principally on farmers, mechanics, inventors and stock breeders. On education their influence has been only general, such as all other environment produces. They cannot be said to have helped to improve the condition of our schools or to have helped to prepare our youth for the stern realities of life. The races have largely improved the general speed of driving horses. The exhibits of agricultural implements have educated farmers to the using of labor-saving machinery, and thus enable them in some measure to compete with the cheapness of western grain. This, however, could be more successfully done if lands, etc.

The fine Holsteins, Jerseys and Guernseys have shown the dairyman that breed blood and butter are as closely related as cause and effect, and that it is just as easy and much cheaper to get from one cow twelve pounds of butter a week as to get three or four. In all branches of their occupation farmers have largely benefited by the exhibits of fairs. Although American fairs have abandoned that legitimate trading, which is the principal feature of European fairs, there clings to our county exhibitions a feature, which, to say the least, is very questionable. It partakes largely of the betting and gambling element. Men are permitted within the enclosure whose only object is to fleece the unwary. The influence of this feature, as well as that of the indecent shows, is only and solely bad.

Our own New York World's Fair, in 1853, with its Crystal Palace, succeeded and was called into existence by the World's Fair of London, 1851. Of its influence and that of the Centennial we do not propose to speak here. They were, however, great schools of the world, bringing together the production of all climates and the people of all the nations. And the good influence they exerted is beyond all calculation.

But taking our county fairs as they are, what is the chief attraction? In reading newspaper accounts the local reporters almost invariably say "The chief attraction was the races." These draw the crowds.

The Greeks of old laid much stress upon harmony of human development. This they stimulated by connecting running, boxing and wrestling with their national festivals. And the victors received great honor and substantial rewards.

Now it might not be in accord with modern ideas of civilization to renew the athletic games of Greece; but the propriety of something of the kind for us appears in the form of the regatta of Yale and Harvard.

What we wish specially to present to this honorable body is tha the directors of every county fair should have in addition to their other departments one specially devoted to education.

This feature has very properly been recognized in *our* own and in *foreign*, national displays. Permanent museums for educational displays have been founded. England has its South Kensington Museum; Germany, its Nuremburg Museum of Industrial Art and even Russia has its Pedagogical Museum at Petersburg. We have of course our own Smithsonian Institute; but our country is too large to depend upon *one* or *even* a few such institutions.

Being justly proud of our free public schools, we should employ every means possible to make them what they ought to be. One means to that end would be to invite teachers, directors and superintendents to make a display of their work at our county fairs. Is it possible, that we are prouder of our horses and cows than of our children? Does the house wife who makes a ball of delicious, golden butter, or she who can bake a snow white, light loaf of bread, have a greater right to display her work than she who can cultivate human souls? And should we take greater interest in poultry, blooded stock and fast horses than in the education of our children? The workers in the field of education need stimulus and encouragement as well as bakers, farmers, breeders, coachmakers and mechanics.

There should be brought together samples of the various articles of school apparatus, specimens of the text books and the school furniture of every description used in the various townships. Specimens of the best and poorest work done by pupils in the various grades and classes of schools should be on exhibition.

Premiums should be offered for the best in every branch, whether of furniture, text books or pupil's work. Such a collection properly managed, would give much needed information, not only to teachers and school officers, but to all others interested and engaged in carrying on school work. It would also stimulate pupils and teachers to greater efforts to do their work to the best of their ability.

By adopting and carrying out such a plan our county fairs might help very materially to produce that change in the common school course of instruction which modern life requires.

Governor Beaver very properly says: "The schools should teach what the children ought to know."

Spencer says education ought to prepare for complete living; that is, the physical side of man as well as his intellectual and moral should receive proper attention.

Sooner or later Americans will learn that the physical cannot safely be neglected. As a nation we cannot set our pyramids on their narrow or upper bases. All moral and intellectual greatness must have a physical foundation. The ancient Spartans understood this. It was due to their system of education that Leonidas and his three hundred were able to oppose so long the hosts of Xerxes.

Even the condition of a minister's stomach will affect his praying as well as his preaching. All of which means that our children ought to have taught how to live practically as well as how to read, write and cipher.

The ancient Cretan boys had to bring their breakfast down from a tree by a sling or go without. In consequence their acquired skill in slinging gave them a world-wide reputation and they found ready and remunerative employment. So proper premiums offered at fairs for whatever the schools ought to produce and an honest exhibition of what they can now produce, would no doubt produce such changes as the necessities of the times may require.

MUSIC AMONG FARMERS.

By Prof. J. W. Graeff, *Lebanon, Pa.*

The subject of music is one of much interest, treating it in its progressive stage, as well as the beneficial influences all have in a knowledge of it, and the pleasure derived by its study.

We glance at mechanics, science, art and the stamp of progress is noticed on every thing we look at.

The hum of industry and marks of improvement are displayed from one end of our grand country to the other, and it can thruthfully be said, we are living in a progressive age.

A few years ago, men and women earned their daily bread by hard, laborious work, using hand and body to accomplish their task. Labor to-day has been lessened by labor-saving devices, and we are compelled to admit that these many improvements are beneficial.

Every man, woman and child to-day enjoys life more by the discovery and application of means whereby hard work is made play; not only has the work each day been lessened in time, and wearisomness as a consequence of these great changes, but production has been increased, wages advanced, and the enjoyments of life made more accessable.

As in mechanics, as in science, as in art, so is the progress made in music; and this advancement is mainly due to the fact that hard work is outdone by invention, and more time is given to study and education in all its phases, and, naturally, music gets its share of attention. A marked change has taken has taken place in the cultivation of the ear to sound, and the soul to love and express by melody the inmost feelings of man's nature.

We look at education in all its branches, and note great advancement, we look at art and find how progress is stamped on its face, and we can of truth say that in all these we outrival our sister continent; but music has not taken the aggressive step it should have, and has not kept pace with the many other advances made by us as a nation. It is only a few years ago that a real genuine interest has been awakened in the people of the United States to the necessity of the introduction of music. This interest has naturally first been taken by the inhabitants of our cities, yet while we feel that acoustics is yet in its infancy we are glad to see a like interest taken in it by those who have chosen as their life's work the tilling of the soil.

A few years ago little thought was given to music by the farmer, though the sun shone upon God's music stand (the earth) making glad the heart. Little time was taken to sing a song of praise, though the little birds warbled their notes of joy, though the hum of the bee visiting each clover stalk or wild flower gave evidence of the fact tha within all beings and creatures, God created a natural gift, and that gift, music; even the little stream murmured as it coursed through the meadow; this was all of music that could be heard about the farm-house or field. It is not so now, the farmer is not satisfied with the usual daily routine in the field, trodding after the plough, he is not content with the work of attending to his cattle, or the duties about the barn; no, it matters not how tired or worn out he may be, he looks with pleasure to the time when evening casts its shadow upon the day's work, and the time approaches for musical entertainment.

He no more considers it loss of time to sit for an hour or more playing an instrument of music or sing some familiar song, but regards it as having a wider latitude, he considers it a science as well as an art, and an accomplishment worth his daily study. He finds in it expression of feeling; he reads in it poetry; he sees in it pleasure; and today in nearly every farm-house can be found the young of both sexes indulging in song and endeavoring to rival with each other in the manipulation of the ivories of the piano, organ, or playing the violin, flute or some other favorite instrument.

Now that we have seen that music is elevating and that it brings pleasure, we also agree that it is the most neglected of arts on our continent. Taking into consideration that of all the arts it is the most natural to man, we wonder at this neglect. Each nation on the face of the globe, matters not how for north, south, east or west they live, civilized or uncivilized have some way of expressing their joys or sorrows by sounds peculiar to their tastes. In reality, the time when we as a nation have advanced in the cultivation of sound by voice or instrument, and when a greater interest began to develop itself in the direction of music can be figured down to thirty or forty years, and a much less time since the farmer made an effort toward educating himself in this delightful accomplishment.

The advancement we are happy to say is rapid, and there is hardly a farm-house to be found that does not have in its parlor an organ, piano or some other instrument to while away the time of the long and weary evenings.

We learn that in our own county there are no less than nine hundred Miller organs, besides about four hundred pianos scattered through town and county, mostly through the county. We are glad to say that very few of them are merely ornaments, but, the contrary, the young gentlemen and ladies of the country often surpass the people of our cities in displaying their tastes in music, paying more attention to practice and study.

Not taking the interest into consideration in piano and organ playing, we notice what great progress is made in playing orchestra and band instruments by the boys. There is not a village, however small, but on stated evenings they can be seen trodding along in all kinds of weather, walking for miles after a hard day's work, going to rehearsal.

Ten years ago, Lebanon county had only four or five brass bands, two of which were in Lebanon, now there are fifteen bands, with an average membership of twenty, making the number in total three hundred. Two hundred of these are the boys from the country, and there are few poor bands at that, the same satisfactory remarks can be made about the advancement of music throughout the State. Now that there is so great a change, and that the boys of our farms have started the ball rolling in interest in instrumental music, we see much improvement yet to be made in voice culture, especially among the fairer sex in city or country. Education in all branches, mathematics, geography, history, languages, etc., has advanced. The young people of the country are becoming more intelligent, their German dialect is improved and there are few who a few years ago were unable to speak, read or write the English language have now mastered all. Music should be taught in our schools as well as the other branches, not only in the towns and cities but in every school house in the country.

The most absurd questions are placed before us, as to whether any person can be taught music? We say yes! Not every scholar who studies mathematics is a good mathematician, neither is he who studies history a good historian, neither is he a good linguist who studies the languages, they, however, are benefited by a knowledge of them, and so it is in music, all who study may not turn out to be first-class musicians, but all will be benefited, and many more hearts will be happier and many more homes made brighter. The fact that so many instruments are being introduced in our homes, and so many of our farmer boys' and girls are advancing in this art without teachers, is a proof not only that they can learn it, but the necessity of its being taught.

In every school where music is taught we find the beneficial results in this that it is a great assistance in maintaining discipline, and tends to create in such schools a high moral tone. Wherever it is introduced as a study it is loved by all. It is a study in which time is spent in an educational way and serves as a stimulus to all other school work. It produces the highest intelligence and self reliance; the pupils gain the power to think and do for themselves; and both mind and heart are being cultivated to higher and nobler aims. What a shame it is that talent of the highest order is being neglected, talent which if nurtured and cultivated would be of so much use to society and the young of our land. Good voices can be heard at every country pic-nic. Girls and boys who have splendid voices can be heard sing familiar airs at such gatherings who hardly ever open their mouths at home. The miserable old tune of Bingo takes the place of a better and higher class of music, merely for the want of musical training. Instead of little operatic selections and better still some of our beautiful Sunday school music, low, trashy songs are indulged in even at Sunday school pic-nics.

It is at such gatherings that a whole day is spent in singing Bingo with the butcher or farmer and his dog. How often I wished the butcher had his cleaver and would cut off the head of poor Bingo, and the tail too, for were that left no doubt pic-nickers would take hold of that and keep on singing. However, it is in these songs that we hear some really sweet voices, which if trained would give praise to God instead of singing the low trashy stuff just alluded to. With all the progress and advancement in everything, we still see much improvement to be made, especially in music, it has progressed wonderfully in a few years and it is to be hoped the day is not far distant when the most natural talent God has given to mankind, that of music, will be among the foremost of the arts and sciences, and that every school house in the country will give attention to its study, and when every man, woman and child will see the necessity of advancement in this most delightful study, and that our churches will be filled with such as can pray in song, and that in our homes we will hear the old and young singing and playing good classic music.

PROGRESSIVE FARMING.

By Prof. OLIVER D. SCHOCK, *Hamburg, Penna.*

I feel sorry that the honor conferred upon me by your secretary was not bestowed upon some progressive farmer; but it is generously conceded that within our hearts and minds are fallow meadows that are inspired and instructed by the great fields and orchards which surround us. The fruit and harvest of our life is, in a measure, dependent upon the inspiration and knowledge derived from a pastoral life. On our grand and unequalled continent the Indiàn was probably the first example in so-called progressive agriculture, for wherever their lodges and settlements were located, along the turbulent rivers or placid streams, amidst the grandeur of primitive forests, the soil was rich in natural plant-food, showing their wisdom to chose wisely, and discernment not credited to every farmer even in this modern age of surprising wonders. To the farmer who is satisfied with following in the footprints of the husbandman of a century ago, the term "progressive farming" is meaningless. The principal mission of a progressive agriculturist is in raising the greatest amount of food products with the least possible expenditure of time, money and labor. Competition among farmers as to who can produce the largest and most profitable crops and introduce the latest and best implements, new varieties of grain, fruits and vegetables, and what is almost equally important, good strains of live stock, are all important factors in promoting progressive farming. These advantages were denied our pioneer farmers of a century ago and should alone be sufficient to make the agriculturist of the present period successful and independent. The progressive farmer is not afflicted with mere theories, he is intensely practical, which fact may be regarded in all truth and sincerity as a distinct inheritance from the era that noted successful voyages to this comparatively newly discovered continent. In passing through the beautiful Lebanon Valley, the most casual observer cannot fail to become impressed with the stamp of progressiveness that is presented in a magnificent panorama on every side. The dwelling houses and large barns are of the highest order, and the modest homes of the pioneers have given place to residences that may almost be termed palatial. Beauty is also conspicuous in the surroundings until it may be truthfully said "a thing of beauty is a joy forever." The prosperity of agriculture is dependent not alone upon the seasons, but to a large extent upon the intelligence of its laborers. In this era of cheap literature the farmer can keep abreast with the brightest thoughts of the age and learn of the constant changes and improvements and contrivances which experience, genius and skill have produced for our mutual benefit. The genius of inventors and the enterprise of manufacturers have combined in introducing implements that render the performance of a large proportion of farm labor comparatively easy and less expensive than formerly, thus shortening and lightening the duties incident to farming.

The progressive farmer no longer terms improved machinery a luxury, and is not slow to adopt it and acknowledge its superiority if it possesses genuine merit. It is said that man first discovered the location of his stomach when its workings became deranged, and the simile can be applied in the conduct of farming operations. Should the climatic influence prove favorable, and the crops yet fail to respond to meet the expectations of his labor, the farmer can consult with the chemist who will determine which elements of plant food are lacking and prescribe intelligently for the treatment of the soil. A sure knowledge of the reasons for every operation and native ability are requisites of the progressive farmer who is seldom duped by false systems. Compensation in the fullest sense of the word are the rewards for the services rendered; yet the progressive farmer will perform many services without any hope, expectation or desire for pecuniary reward. The approval of our own conscience is deemed a sufficient reward. Ancient history is responsible for the assertion that the tiller of the soil was not accorded the esteem and honor to which he was entitled, but the husbandman of to-day is not debarred by caste in any form or manner, and the horizon of his privileges and liberties is practically unlimited. No honor, position or emolument within our society or government can be so exalted or distant that he cannot reach it if he but possess the necessary qualifications of character and integrity. This progressive spirit has established and maintained that power which will produce just rewards and promote our general welfare. About three-fourths of our entire population are engaged either directly or indirectly in the industries of agriculture, and the reason why this vast majority is not more numerously represented in our National House of Representatives or State Legislatures consists in the simple fact that the heart of the average farmer is averse to political excitement and its consequent animosity and trials of mind and body. To commune with nature, midst the blossoming trees, ripening fruit and waving grain, and the opportunity to enjoy the domestic hearth are all charms that a progressive farmer appreciates with that peace of mind that contributes so largely in filling his "vase of joy." Surrounded by a world that offers a large and almost inexhaustible field for experiment and practice, thought and labor, the progressiveness of the American farmer has produced more original matter founded on experience than can be obtained from the history of nations many centuries old.

Promote, then, as an object of primary importance, all publications that have a tendency to improve and elevate agriculture; institutions which are organized for the general diffusion of agricultural knowledge, and especially your local organizations. Good policy enjoys it; for our entire strength as a government and nation depends upon the successful interweaving of these natural interests.

LIME AND ITS ACTION.

At the Lancaster meeting, Casper Hiller, of Conestoga, Pa., read an essay upon the above topic, from which we make the following extracts:

"Lime, in the general acception of the term, is a manure. That it has been properly used by our farmers in this section of the State is evident from the frequency of its application. It is applied to sod land for corn, and along with stable manure for wheat, at the rate of from 50 to 200 bushels per acre. Some of our 100 to 200 acre farms have been using yearly from 2,000 to 3,000 bushels.

"When we take into consideration the vast amount of labor and the expenses involved in the production and application of lime, the question of its action becomes a very important one. Let us, therefore, take into consideration lime as a manure. We might ask what is manure? The answer is anything applied to the land which contains the elements that enter into the crop which we wish to produce. Our best manure is made in the steer stables of the progressive farmer who feeds liberally of bran, cotton seed meal, oil cake and corn meal.

"The chemist will tell you that phosphoric acid, potash and nitrogen abound largely in stable manure, and that they are the principle elements which enter into all of our grain crops. The chemist will also tell you that none of these elements are contained in lime, and that lime is only valuable as far as it is an element which enters into the grain crop. He will further tell you that but a small amount of lime will be absorbed by the wheat grown upon an acre of ground. What then is the action of lime? A late writer in one of our leading agricultural journals states that 'lime is a solvent of the mineral constituents of all crops which are produced from the soil.' Lime a solvent of potash? of nitrogen? of phosphoric acid? I do not know how it is, and cannot believe it. Perhaps the chemist can tell you; I believe that the main action of lime consists in quickly dissolving the vegetable matter contained in the soil. Apply one hundred bushels of lime to a heavy clover sod intended for corn and the result will be an increased crop, but since you have added no plant food to the soil, is it not a repetition of the old story of killing the goose which laid the golden eggs? This making the vegetable matter quickly available by liming would, long ago, have impoverished our land if we had not been applying large quantities of stable manure and plowing down clover. Clover is our great humus maker.

"When we make a comparison between our newly cleared land and our old fields we can learn to appreciate humus; the old fields appear to be all clay, sand and gravel; the woodland all vegetable matter. These newly cleared woodlands bring our best crops. The humus not only feeds the crop but also puts the soil into the best mechanical condition; this should teach us to encourage the accumulation of humus and permit it to impart its good qualities by natural decay instead of making it quickly available by the use of lime.

"Another argument against the use of lime is that it costs more per acre than would a good dressing of complete commercial fertilizer; such a fertilizer as would contain all the necessary elements to produce a good crop; and it would leave the soil in as good or better condition than it was before its application. I have an upland lot of naturally thin land, mica slate formation, that was cleared about thirty years ago, the timber being principally chestnut. This lot was never limed, and since I have had it in possession (eighteen years) it has received but one dressing of stable manure. It will to-day compare favorably for productiveness with any similar soil that has been treated with stable manure and lime in each rotation."

(*Note by the Secretary.*) The discussion which followed the reading of this essay demonstrated the opinion that in the common acceptance of the term lime cannot be classed among our manures; that is, it does not add important elements of plant food to the soil as does barn-yard manure or as do the commercial fertilizers; hence it follows that the farmer who constantly applies lime and sells the products of his fields off the farm, will gradually make his ground poorer. That he is in the position of the borrower who is compelled to borrow money with which to pay interest. Upon the other hand it was an evident opinion among those present that the farmer who increased his crops by the application of lime and fed that increase upon the farm, taking care to avoid waste in the barnyard, would necessarily make his farm richer and more productive each year. It seemed to be admitted that the main action of lime was due to its effect in rendering inert matter in the soil immediately available to plants. That it had the power of decomposing certain inert compounds found in the soil and from their elements forming valuable and soluble compounds which could enter directly into the circulation of the plant. The discussion also seemed to lead to the conclusion that lime was an assistance in making the decaying vegetable matter in the soil more readily available for the crops. That when lime was added this inert vegetable matter at once commenced to decay and was soon in a condition to support plant life. That the addition of lime to a soil destitute of vegetable matter was not accompanied with the same degree of action as when this kind of matter existed in abundance and that in fact the action of lime upon any given soil could be gauged by the amount of partially decayed vegetable matter in that soil. Hence it follows that lime, as it merely renders available that which already exists in the soil and adds nothing of itself, cannot fairly be classed among the manures. That its action is more of the nature of a stimulent than a manure.

It was noted by one or two that the farmers of eastern Pennsylvania had ceased to apply lime because, as they claim, it does not pay as it used to do: as a reason for this, it was suggested that possibly by the continued application of lime, the supply of vegetable matter in the soil had become exhausted and that when this supply was replaced, the application of lime would again be found profitable. As an argument against this phase of the question, it was urged that no matter what might be the cause of the failure of lime, the crops had not been reduced as would have been the case if its failure to produce an effect was due to the absence of vegetable matter. It seemed to be the almost universal opinion that sooner or later its application would be found profitable again.

There was much difference of opinion as to what crop or at what stage of the usual rotation of corn, oats, wheat and grass, it should be applied. Deciding from an analogy of reasoning, it might be inferred that the most profitable time was that at which the soil contained the largest percentage of vegetable matter. This is no doubt when the sod is turned down for corn, and that, in the opinion of most present, seemed to be the proper time. Some, however, were favorable to its application to the stubble (young grass) after the wheat was taken off.

At one of the meetings of the Board, the debate having taken a wide range, the following discussion took place:

E. W. HALE, of Centre. I come from a limestone section of the State, somewhat similar to that from which my friend from York (Dr. Roland) comes from. I have also farmed in Huntingdon and Mifflin counties where the soil was sandy and gravelly and underlaid with clay, cold and wet. My first experience was with fertilizers, when I bought bone for forty dollars per ton. This was a number of years ago and I can see the effect of the bone yet. I followed it up with lime. It is an old saying with us, that where you put up limestone to burn into lime, it will so injure the soil that for years you will not be able to raise anything of value on it. But upon this farm the second year, the ground was thickly strewn with clover. Where it came from I do not know; I did not sow the seed. I have limed a great deal and have applied fertilizers liberally, on both limestone land and on sandy soil. One year I invested twelve hundred dollars in fertilizers of different kinds. If you want something that will act quickly, use fertilizer. Where you can raise clover you can raise wheat; that is if you are careful not to take your clover all off. Turn some of it under, it is the cheapest fertilizer you can obtain. The fertilizers which you buy are expensive and where you have a tenant farmer he is disposed to spread it too lightly, so as to make it go as far as possible. If he would put on five acres what he now puts on ten he would have better results and larger profits.

I have a good opportunity of getting "lime ashes"—that is the ashes which are left after the lime is burned and which contain more or less of the lime. In this way I obtain lime at a low cost, about three cents per bushel. I find the best way to use it is to put it on top of the ground, using it on the cornfield after it is plowed, and and harrowing it in. But one of the best ways is to put it on the young clover. Do not put on a hundred bushels to the acre, but put on sixty to seventy-five bushels, and then when you have gone over the farm once, go over again. I would rather put on half the quantity and then commence again in half the time. Some put on one hundred and fifty to two hundred bushels per acre. They are doing their land an injury. I think that any amount over sixty to seventy five bushels is lost. All that you want is enough to stimulate the soil.

POTATO CULTURE.

After a paper on "Potatoes and their Culture," by L. B. Speaker, of Sullivan, the following discussion took place:

Dr. E. L. **STURTEVANT**, Geneva, New York. I am always afraid to express my views upon potatoes and potato culture for fear that another year's experience may lead me to reverse my opinions; I think that I have a fact established one year and the experience of the next exactly contradicts it; I can, however, give you the points upon which I am now working in my experiments. We grew last year potatoes from seed taken from the most prolific hills, and also from the least prolific; we found the tubers selected from prolific hills gave a superior crop; the superiority was so manifest that it would almost justify us to recommend farmers to save their seed only from the most prolific hills; the gain on the average was in the relation of 85 to 100; this experiment seems to indicate that deterioration in a variety whereby a good variety tends to become less and less profitable to grow, arises from the entire lack of selection, and that to obviate this it may only be necessary to select seed from the most prolific hills, instead of at hap-hazard from the harvested crop. I will have to contradict a former statement of mine as to the influence of cutting upon the yield of the crop; in 1882 I had a hundred or more of duplicated experiments all going to show that there was an increase in the crop where single eye cuttings from large potatoes were used; the experience of 1883 and 1884 was not confirmatory of that of 1882, that is not as to quality. I think that we shall ultimately come to the conclusion that the method of cutting will be governed somewhat by the fertility and physical character of the soil; the indications are that there is an improvement in quality by the use of a small number of eyes, but even this statement must be made with due allowances.

A **Member.** Would it not be best to select seed wheat from the best heads and seed potatoes from the best hills?

Dr. E. L. **Sturtevant.** The indications are certainly in favor of this plan of selection; improvement may not follow the selection of the best seed, but improvement will follow the selection of the best seed from the best plant. We recently had an experiment which has some bearing upon this question. We selected potatoes of as nearly the same size as possible; three of these were weighed carefully and analyzed for the amount of dry matter which they contained; three were planted on rich soil and three were planted in sand; after growth the plant was dug up and weighed. In the barren soil the seed potato lost a great deal of its dry matter, showing that it furnished food for the plant. In the rich soil there was less absorption, showing that the plant was enabled to obtain its nutriment from the soil; the deductions from this are that on rich soil a single eye is preferable, while on thin soil the pieces should be larger, but this should be verified before it is given out as a fact.

I. **Garretson**, of Adams. Does it make any difference as to which side of the cutting is down?

Dr. E. L. **Sturtevant.** With some varieties, such as Burbank's Seedling, no difference can be recognized, but with less vigorous kinds I consider it important that the cut side be down so as to give the shoots the best possible chance to reach the surface.

H. M. **Engle**, of Lancaster. If we observe closely the temperature of the soil we can, to a certain degree at least, avoid failure. I consider it good policy to plant my potatoes as early as possible, and have them grown without extreme heat. In the early part of the summer it is not dry and the soil is not heated through, and if we can get the crops in so as to be pretty well advanced it is much better. By this plan I very seldom fail. We usually make two plantings. We never plant in May, but prefer (if the ground is in proper condition) to plant in March, and have them up and forward before dry and hot weather sets in. Our later crops are not planted until in June. The potato as a plant flourishes best in cool weather when it has plenty of moisture; the cooler the soil, within certain limits, the better, of course the date of planting will be regulated by the latitude and situation.

Note by the Secretary. The discussion which followed the reading of Mr. Speaker's essay, only a portion of which is here given, clearly demonstrates the common error of endeavoring to apply to potatoes the same rules which govern the selection of grain for seed; there is no analogy between the two. The potato is in no sense of the word a seed, but is merely an underground stem, and their propagation is subject to exactly the same rule as the cutting from a fruit tree; with the tree we insert the cutting in another branch, and with the potato we place it in the soil instead. In both cases the portion taken with the cutting must support the eye or bud until it can make good its connection with the stock or soil; after this connection is once made it is entirely independent of its parent. Potatoes of large size and with but few eyes usually make a vigorous growth, because in cutting we take with their eye a considerable portion of the parent potato, and this nourishes the eye until roots are thrown out. If the piece be small and contain several eyes, each growing stalk must sooner obtain its nourishment from the ground, and thus its growth will be slower. The fact that sprouts may be taken off without any of the potato and will grow and produce a good crop, proves that the piece of the potato is not absolutely necessary to growth; but inasmuch as the primary nourishment can be obtained more readily from the cutting than from the soil, we prefer large cuttings. Any rule which holds good with ordinary grafting and budding will also apply to potato cuttings, because both are simply stems, and neither are seed. The rules of selection which hold good in relation to grains cannot therefore be applied to the potato. If it is only well ripened, a small potato may and will give as good a crop as a large one, and the only reason that we obtain the best results from the large ones is that those of smaller size are usually not fully developed, or, in other words, are not well ripened.

THE USE OF FERTILIZERS.

At the Lewisburg meeting, after J. A. Gundy, member from Union, had delivered an address on "Experiments with Fertilizers," the following discussion took place:

DAVID WILSON, of Juniata. I suppose that there are farms in your neighborhood that have been cultivated for a number of years. They have been raising horses, cattle, sheep and hogs, and have been selling the meat off the farm all the time; they have been raising grain and selling it off the farm; all taking away more or less of the fertility of the farm. How, under the light of your experiments, would you repair or prevent this draft upon the fertility of the farm?

J. A. GUNDY, of Union. I presume that the gentleman understands that out of each one hundred pounds of these fertilizing materials all but about three pounds is supplied by the soil and atmosphere in great abundance. There are but about three pounds in each hundred that we need worry about. These three pounds consist of potash, phosphoric acid and ammonia. Some plants have the power of taking nitrogen (ammonia) from the air; it is there in great abundance, but it is not in the form in which plants can utilize it. As is shown by my experiments the corn had plenty of it, so that I think we need not consider the ammonia as of as much importance as the potash and phosphoric acid. The two latter must be added to the soil in some form or other. The bones of the animals which have been carried from the farm, and the grain which has been sold off, all contain phosphoric acid. Nature has stored up a vast amount of this phosphoric acid in South Carolina rock, and we can replace our loss by using this as a fertilizer.

Secretary EDGE. Did you not find that the different kinds of fertilizers more or less affected the time of ripening the crop, and that at cutting time some plots were much greener than others; would not this condition more or less influence your results? Would not the fodder from some plots have more water in it than from others? Upon my farm the result of a similar experiment would vary altogether with the portion of the farm upon which it was tried. Upon one side, composed of slaty soil, potash fertilizers give little or no result, while the same fertilizer applied to the other side of the farm, which is heavy limestone land, would produce a great effect. But the experiments of Mr. Gundy are very valuable to all who have similar lands, as they show exactly the effect of different fertilizing ingredients which usually go to make up our commercial fertilizers. Each farmer should, like Mr. Gundy, experiment for himself, and ascertain in that way what element gives him the best result. He can thus save himself from a useless waste of money in the purchase of ingredients (often very expensive) which will prove of no use to him.

Mr. Gundy. I think that my fodder stood in the shock for twenty-two days before it was weighed. Each plot was treated exactly alike in cutting and weighing, and the fodder was all stored away alike. The shocks were small, as I only cut five rows of corn in one row of shocks, and of course the shocks were small and had a good opportunity to dry well. Secretary Edge is undoubtedly right as to obtaining different effects upon different kinds of land, but we have nothing more reliable than experiments for our guidance after all.

Mr. Nesbit. With regard to Mr. Gundy's table and his full explanation of it, I would say it is not safe to take one or two experiments and generalize from them. It is apparent that his soil is lacking in potash, but it does not necessarily follow that if we could all apply potash that we would obtain similar results. Its application in different localities would produce very different results.

J. A. Woodward, of Centre. I would like to ask Mr. Gundy what conclusions he draws from his experiments? What do they prove? Do they prove anything more than that your soil demands potash?

J. A. Gundy. No, sir; I do not present them as proving anything beyond the fact that my field needed potash; but I think that the experience of everyone proves that corn demands a large amount of potash.

J. A. Woodward, of Centre. If I have understood Secretary Edge correctly, he states that one portion of his farm responds quickly to potash, while the other portion is scarcely affected by it. He has also stated that large numbers of carefully conducted experiments show that as a rule all soils will respond to an application of phosphoric acid. His statements and the experiment of Mr. Gundy clearly prove that we must each one experiment and find out what our farms need in the form of a fertilizer. We must go to work as Mr. Gundy has done and find out what elements are needed and what are not, and then use the former and avoid the latter.

The Presiding Officer. The remarks of Secretary Edge and Mr. Woodward have brought out this fact: that there is nothing which we use in such an indiscriminate manner as commercial fertilizers. In some fields they are needed, and in some they produce little or no effect. I also think that we make another error in applying all fertilizers to all crops at about the same depth. They should be applied at or near the surface for shallow-rooted quick-growing crops, and deeper for deep-rooted and slow-growing ones. For oats the fertilizer should be at or near the surface, and for wheat or corn it should be plowed in under a light furrow or applied with a wheat drill. For this reason I am in favor of experiment stations.

J. A. Woodward, of Centre. Upon this question of lime let me ask Mr. Gundy a question. Do we use lime as a fertilizer or as a solvent for fertilizing elements already in the soil?

J. A. GUNDY. Lime is not a fertilizer in the strict acceptance of the term. Our crops require very little of it; a little over a quarter of a pound in the hundred; it has a chemical effect on the soil; I think that the theory that lime makes immediately available the plant food which is in the soil, is correct. The man who uses lime gets the immediate effect and leaves his son, who may come after him, with that much lost plant food.

J. A. WOODWARD. If one-half of the lime had been applied to plot number ten and one-half the amount of ammonia, would it not have been a wiser application?

J. A. GUNDY. I think that forty to fifty bushels per acre is an ordinary application; I thought that I was applying it moderately.

J. A. WOODWARD. If applied with the ammonia would it have been an advantage?

J. A. GUNDY. No; the lime will cause the ammonia to evaporate and it may thus be lost; lime and other alkalies should be kept away from manure containing nitrogen or ammonia.

R. S. SEARLE, of Susquehanna. I do not feel like going back upon lime because I have seen good results from its use; but it strikes me that we may draw important lessons from this discussion, but time will not permit me to go into full details; I think that one point well made is that any single experiment cannot be taken as a rule to go by; but that each farmer should experiment for himself and learn the special needs of his soil. We must educate ourselves on the science of farming before we make a science of it. There is something more than plowing, sowing and reaping; you must know how to go about it in the proper way and not blindly.

JACOB BOWERS, of Union. I would like to know from Mr. Gundy how to make the best barnyard manure; how to get my straw and fodder worked up into the best possible manure, and after having made it, how to keep it in the yard in the best condition?

J. A. GUNDY. I hardly think that this question should have been directed to me; there are others here who are much more competent to answer it; present experiments show that the best way to handle yard manure is to haul it to the field as soon as it is made, and spread it at once; the loss by evaporation is not as great as the loss by keeping it in the yard all summer; I presume that the proper answer to your question would be to haul it out as soon as possible.

Mr. BOWERS. My farm is somewhat hilly, and the manure would lose by rain and leaching down the hillside.

Secretary EDGE. Careful experiments have proven that the loss from rain has been greatly exaggerated; unless the soil is frozen very hard there will be but little loss as has been proven by careful experiments; let the gentleman try the experiment with a few loads on a moderate hillside; when the field is cropped he will note that the effect of the manure is not noticeable very far below the lower edge of the land to which it was applied; I am of course alluding to lands of moderate slope and not to steep hillsides; let any one try the experiment and he will at once find that the loss from rain has been much exaggerated. It is a mistake to infer that all dark water passing from manure is fertility; it may be merely decomposed carbon which colors it, and there may be little or no nitrogen, phosphoric acid or potash in it; this, of course, is not always the case, but it is the case in very many instances, and it has led to the theory of the great loss by rain if manure is spread long before the ground is plowed; a reasonably loose soil possess to a strange degree the power of taking out of water any fertilizing elements which it may contain, and the strongest water from the manure pile if passed through a slight depth of soil or through an inch or two of clay will lose all of its fertility, which will be retained by the soil.

Mr. NESBIT. The question raised by Mr. Bowers is not only a practical one but it is also an important one; Secretary Edge has stated that the loss of phosphoric acid and potash has been exaggerated; but the one important element is ammonia, and that is subject to loss in this way; any who are familiar with farming operation is familiar with the smell of ammonia from horse manure; it is my conviction that there is a wide field for economy in the preservation of the nitrogen and ammonia of our yard manure; how can it be best and most economically saved is the question; it may be retained by any substance which will absorb it; clay will do this; gypsum will also do it, we are told; I intend the coming winter to experiment in this direction; I will sprinkle my manure pile with acid and note the effect upon the value. The next question is " What shall we do with it?" It will not do to put it where the cows can eat it; it must also be under cover.

The two other fertilizing elements mentioned by Secretary Edge are phosphoric acid and lime; there are a number of ways resorted to by farmers to supply their farms with lime; there is a large quantity of limestone in this region, and we burn it and thus get quicklime; this, when slaked, is applied to the soil; we make a hydrate of lime out of it before we apply it; every one knows that lime is a strong alkali and will at once absorb carbonic acid; now when I was a boy and the farmers found their crops failing they at once applied lime, and it largely increased the crop of clover; this in turn drew large amounts of ammonia (nitrogen) from the atmosphere and again laid the foundation for increased crops of all kinds; therefore it would seem that lime, while not a manure of itself, is necessary to make a soil productive. At that time gypsum (plaster Paris) was used to some extent, but its price forbade its general use; since we have the means of transportation we can get plaster for a little over five dollars per ton; we can get it ground fine and apply it with a fertilizer drill; it is not all taken up by the first or second crops, and in my estimation is a more economical application than lime; the expense of the application is not great.

For a long series of years our soil has been exhausted of its stock of phosphoric acid. Each animal that we have parted with, each of the wheat crops and each of the hay crops have taken some of it off the farm, and has left our farms impoverished, at least as to this one element. What can we do to replace this loss? And how can we replace it most economically? In South Carolina rock we have an immense store of it; we have, many of us, seen the fine showing that makes on our wheat crops. In former cases the crop appeared to be all right but the heads were not properly filled out and the yield of grain was defective and disappointing The plant had found in the soil all of the elements needed up to the time of the formation of the grain. At this point phosphoric acid was missing, and the plant was in the position of making bricks without straw. I have been applying phosphoric acid through the medium of South Carolina rock, and have found that the increase of the crop will much more than pay for the application. I have not made actual measurements and made actual weights as Mr. Gundy has done, but my own experience and observation convince me that phosphoric acid is the one element usually lacking, and that it is the one which we should replace to ensure increased crops.

J. A. **Gundy**. With regard to Mr. Nesbitt's failure in last years' wheat crop, I attribute it to another and different cause. About the time the wheat was in bloom we had heavy rains which washed the pollen off before the flower had been fertilized, and thus little or no grain was formed.

Secretary **Edge**. The need of the presence of lime as an actual fertilizer entering into the structure of plants has been very much magnified and improperly understood. Many fail to remember that for each pound of available phosphoric acid applied they must necessarily use nearly three times as much lime for insoluble phosphoric acid is in combination with three parts of lime, or if in an available form it is in combination with two parts of lime. One ton of dissolved South Carolina rock contains about 300 pounds of available phosphoric acid and not less than 700 pounds of lime in combination. Thus if we use fertilizers we cannot avoid the use of lime. The gentleman has stated that when slaked the lime is applied in the form of a hydrate. This is theoretically correct, but it is practically incorrect. As soon as it comes in contact with the soil and sufficient moisture, quicklime absorbs carbonic acid and becomes carbonate of lime, or, in other words, goes back, sooner or later, to the condition in which it existed in the original limestone. In many cases the good effects which follow an application of lime are due to the fact that it breaks up certain combinations existing in the soil, and releases valuable elements. Thus if these compounds should contain phosphoric acid (and many of them do) the result would be to realize this fertilizing ingredient and render it immediately available as plant food. In such cases the application of lime is equivalent to an application of South Carolina rock, the only question being as to which will cost the most in proportion to its results. In many soils the effect of lime is to break up compounds containing potash, and thus render this available. If quicklime is mixed with fertilizing material containing ammonia, the combination in which the latter exists is broken up. New compounds are formed in which the ammonia (nitrogen) exist in one of its most volatile forms, and it is therefore usually lost by evaporation. On the other hand sulphate of lime (gypsum or plaster), if in connection with moisture, has the power of fixing the volatile forms of nitrogen and making them less volatile; but to have any effect at all, plaster must be in connection with moisture. Ashes will volatilize ammonia because it contains more or less potash in a caustic form.

DRAINING WITH TILE.

At one of the meetings of the Board, the debate having taken a wide range, the subject of draining with tile was brought up, and the following discussion ensued.

Question: What size tile does Mr. Thornton use?

J. C. **Thornton**, of Erie: I would not use less than three inches and three feet deep; my ground is a muck and gravel loam; I generally dig down to water wherever it is, two, three, four or five feet deep, and then put in the tile; the size I regulate according to the amount of water found; I have a farm of more than four hundred acres, and I thought that I had completed my under-draining several years ago, but last year was a very wet one with us, and I found that I could not readily manage one piece and get it sufficiently dry to put in with onions; it was an eight acre field; this spring I made up my mind that it needed some additional tiling there. I have thirty or forty acres that is tiled every sixty feet, the lines running from each side of the field to the center; in the center we have two six inch tiles and from early in the spring until sometimes late in the fall, these tiles are running full all the time.

If we strike heavy streams, we use four and five inch tile instead of three inch, but at the upper end we use not less than three inch tile. When I first commenced the job I did a great deal of bad work, my father had been in England and saw it done there, and put in an inch and a half tile, but I am convinced that a two and a half inch tile would have been much better, we put a board on the bottom of the ditch, and we have water running all the time.

Rev. Mr. **Lowing**; What will it cost per acre?

J. C. **Thornton**: In my soil a good part of the draining has been done on different times and I have not reckoned closely, nor have I estimated the cost. My farm borders on Lake Erie and my south line is almost a mile from the lake, and running up to the lake road; about three-fourths of a mile from the lake I strike about eight places where the hard-pan come to within six or eight inches of the surface, and it is much harder to dig through than the rest of the ground; this runs from east to west.

I. **Garretson**, of Adams. I come from a portion of Adams county, and we have a great deal of rather poor land there; we have some cold and wet land; we are compelled to economize and count the cost of everything before the job is started. I have endeavored to improve some of my land by under-draining and do it in this way; With three strong horses I turn two deep furrows; the first breaks the sod and the second follows in the bottom of the first, if the second furrow is not satisfactory as to depth I run the third, and sometime the fourth, and so on until I am satisfied with the depth. We then open the ditch about three feet deep. Fortunately for us, nature has provided plenty of stone near by, varying in size from that of my fist to that of my head; when the ditch has been cleaned out we put in the larger stone first, and afterwards filling nearer the surface with those that are smaller; those on the top are broken up fine. We then lay on straw, weeds or similar matter and tramp it down well on top of the stone; we then turn the furrows in with horses and refil the ditch in this way; this is a quick and economical way in dry seasons, but is not so readily done during wet years.

I think that stone drains constructed in this way will drain a greater distance than tile.

J. C. **Thornton**, of Erie: The gentleman thinks that his stone drains will draw the water from a greater distance than tile; I have tested it closely and find that with tile, more water will find its way into the ditch than in any other manner of construction, and certainly more than will get into an open ditch of the same depth and width. Stone drains which run through quick-sand are, in my opinion much more likely to choke up than tile; the method described by the gentleman from Adams would not do for us.

Note by the Secretary. This discussion, only a portion of which is given, appeared to demonstrate that there was, at least as far as some of the speakers were concerned, an erroneous opinion as to the manner in which water enters a drain whether it be of tile or stone. To illustrate, suppose a barrel to be filled with earth as to represent an ordinary soil; suppose that holes be made through the sides of the barrel and into our artificial soil, at various points between the bottom and top; next, suppose that water is poured on the artificial soil just as fast as it can absorb it, and no faster; it will of course, sooner or later become saturated with water, and this water will accumulate and escape through the holes in the sides of the barrel; but which hole will first discharge the surplus water? The surplus water sinking to the bottom of the barrel (to a level of the bottom of the drain in practice) will raise until it finds an outlet by the *lower* hole and if this be of sufficient size will not raise any higher; if the first hole does not permit its escape as fast as it is poured in at the top, it will raise and escape by other holes until it can all find vent; if no openings are made in it the water will raise to the top and we have an artificial swamp or bog, which represents the condition of land which contains too much water. It should be remembered that the surplus water enters the drain from below and not from above and that the term "draw." as applied to the drain, is an improper one. The water sinking through the soil sooner or later reaches a point at which it meets a permanent body of water; the level at once commences to raise, and if it finds vent by an artifical drain or in the natural way by a spring, it will thus escape and do no damage; in many cases it raises to the surface and we have a swamp, pond or lake, according to the amount of water which accumulates. In many cases where there is a gravelly subsoil and where the shape of the subsoil is such as will collect the surplus water into under-ground lakes, a single drain may take the water away from several acres; in many cases a single spring may make acres of ground too wet for cultivation; if an artificial outlet is given the water of this spring, all trouble is avoided. A stone drain will choke twenty times from the bottom where it will once from the top, always supposing that the top is properly protected from the surface water. My own experience, which has been practical, and gained in the ditch, would lead me to discard stone if they were delivered at the side of the ditch free of cost. In the first place a ditch for stone must be nearly or quite, twice as wide as if for tile, and this alone will, in heavy digging, pay for the tile used. After having to relay several stone drains I would now use nothing but tile, but would use two inch tile for sub-drains and graduate the size in the mains to suit the probable amount of water to be carried. Those who have not had practical experience always over-estimate the size of a stream running in an open ditch, and would use larger tile than are necessary; a two inch tile running full of water will make a large stream in the bottom of a ditch one foot wide. In practical work I have the ditches dug and filled by the rod and only sti pulate that a six inch fence board sixteen feet long shall lay level on the bottom; this allows the contractor to dig his ditch as narrow as he pleases, and yet comply with the requirments.

FARM WAGES AND BOARDING FARM HANDS.

COUNTIES.	By the month (whole year), with board.	By the month (summer months only), with board.	By the day (regular work), with board.	By the day (regular work), without board.	By the month (whole year), without board.	By the month (summer months only), without board.	By the day (transient work), with board.	Harvest wages, with board.	Household help per week.	Estimated cost of boarding farm hands per day.
Adams,	$12 00	$14 00	$0 62	$0 90	$16 50	$20 00	$0 75	$1 25	$1 50	$0 30
Allegheny,	15 00	20 00	1 00	1 25	22 00	25 00	1 25	1 50	2 25	40
Armstrong,	18 00	16 75	92	1 10	17 50	24 50	1 15	1 35	2 00	35
Beaver,	13 00	18 00	80	1 20	20 00	25 00	1 00	1 25	2 75	45
Bedford,	11 00	13 50	60	1 00	15 50	17 50	70	1 00	1 50	28
Berks,	10 50	14 00	75	1 00	14 50	18 00	1 00	1 20	1 85	30
Blair,	13 00	15 00	1 00	1 20	22 00	26 00	1 20	1 25	1 75	35
Bradford,	16 00	20 00	1 00	1 50	20 00	25 00	1 25	1 45	2 50	50
Bucks,	13 00	16 00	1 00	1 25	18 00	20 00	75	1 50	2 00	30
Butler,	12 50	16 75	94	1 10	16 50	20 00	78	1 37	2 00	32
Cambria,	18 00	20 00	75	1 00	25 00	26 00	1 20	1 50	1 50	25
Cameron,	12 00	15 00	1 00	1 30	22 00	25 00	1 20	1 50	2 50	40
Carbon,	18 75	16 50	87	1 20	19 00	23 00	1 25	1 70	1 75	30
Centre,	12 00	15 00	75	1 00	17 00	20 00	1 00	1 25	1 50	40
Chester,	11 50	18 00	1 00	1 15	18 00	24 00	1 00	1 75	2 25	33
Clarion,	14 00	16 00	75	1 00	18 00	20 00	87	1 20	2 50	30
Clearfield,	15 00	20 00	1 00	1 50	20 00	24 00	1 00	1 50	2 50	45
Clinton,	12 00	14 00	70	1 00	20 00	22 00	1 00	1 25	1 50	30
Columbia,	12 00	14 00	75	1 00	18 00	20 00	1 00	1 50	1 50	36
Crawford,	12 50	15 50	80	1 00	20 00	25 00	1 10	1 50	2 00	22
Cumberland,	10 00	12 00	75	1 00	14 00	16 00	1 00	1 25	1 75	25
Dauphin,	12 50	14 00	75	1 00	20 00	25 00	1 25	1 00	2 00	30
Delaware,	18 00	20 00	1 00	1 25	25 00	30 00	1 35	1 75	2 50	40
Elk,	13 00	17 50	90	1 15	20 00	24 00	1 20	1 85	1 75	35
Erie,	15 00	18 00	1 00	1 25	20 00	23 00	1 00	1 75	2 00	25
Fayette,	12 50	18 00	1 00	1 25	20 50	25 00	1 10	1 50	2 00	25
Forest,	11 25	14 50	90	1 10	16 50	20 00	1 00	1 35	1 25	30
Franklin,	10 50	13 50	78	1 00	14 50	17 50	1 00	1 30	1 65	30
Fulton,	10 00	13 00	60	87	14 50	20 00	65	1 50	1 50	25
Greene,	12 25	14 50	75	1 00	16 50	19 50	94	1 65	1 75	32
Huntingdon,	18 00	15 00	75	1 00	17 00	19 00	90	1 75	1 75	40
Indiana,	12 50	17 50	90	1 15	20 00	25 00	1 05	1 55	1 50	32
Jefferson,	12 00	14 00	65	1 20	20 00	24 50	75	1 00	1 50	40
Juniata,	10 00	18 00	60	90	15 00	18 00	75	1 10	1 50	40
Lackawanna,	15 00	18 00	60	85	22 50	24 50	1 00	1 75	2 00	30
Lancaster,	13 00	15 00	1 10	1 10	22 00	24 50	1 00	1 40	1 75	30
Lawrence,	12 00	15 00	1 00	1 20	20 00	22 50	1 00	1 25	2 00	40
Lebanon,	14 00	18 00	75	1 10	20 00	23 00	1 10	1 25	1 75	35
Lehigh,	13 00	17 50	75	1 15	18 50	24 75	1 00	1 65	1 50	33
Luzerne,	15 00	18 00	1 00	1 10	24 00	26 00	1 20	2 00	2 25	32
Lycoming,	12 00	16 00	75	1 00	22 00	24 50	1 00	1 50	1 75	30
McKean,	18 50	20 00	1 00	1 20	22 50	25 00	1 00	1 25	2 25	45
Mercer,	10 50	13 50	85	1 00	18 00	22 00	1 00	1 70	1 75	33
Mifflin,	10 00	12 00	67	85	16 50	18 00	65	1 10	1 50	30
Monroe,	11 50	15 00	74	90	16 75	19 00	70	1 00	1 85	30
Montgomery,	13 00	17 00	85	1 00	18 00	23 00	1 00	1 75	1 50	35
Montour,	11 25	15 00	87	1 00	16 50	22 50	1 00	1 50	1 50	32
Northampton,	12 50	18 00	1 00	1 35	22 00	24 00	1 10	1 75	1 75	40
Northumberland,	11 00	15 00	75	1 10	20 00	22 50	75	1 50	1 50	30
Perry,	8 50	11 00	60	90	12 50	15 00	62	1 00	1 25	30
Philadelphia,	15 00	18 00	1 00	1 25	24 00	30 00	1 50	2 00	2 00	45
Pike,	14 00	17 00	75	1 00	20 00	22 50	75	1 25	2 00	45
Potter,	12 75	14 50	70	92	15 00	19 75	70	1 35	1 25	31
Schuylkill,	13 50	18 50	1 00	90	18 50	24 75	80	1 90	1 50	30
Snyder,	10 00	12 00	60	1 00	16 50	21 00	1 00	1 25	1 50	25
Somerset,	12 00	14 50	1 00	1 25	20 00	23 50	1 25	1 50	2 00	35
Sullivan,	12 50	15 50	90	1 25	20 00	22 50	1 00	1 50	2 25	45
Susquehanna,	13 00	17 50	75	1 20	20 00	22 00	85	1 40	2 00	33
Tioga,	12 00	20 00	1 00	1 40	20 00	24 00	1 50	1 75	2 00	25
Union,	11 00	13 00	75	1 00	18 50	21 50	1 00	1 50	1 75	30
Venango,	12 00	16 00	1 00	1 25	18 00	21 50	1 00	1 25	2 00	25
Warren,	14 00	17 00	90	1 25	18 00	22 00	1 25	1 50	2 00	35
Washington,	15 00	18 00	1 00	1 25	20 00	24 00	1 25	1 75	2 00	45
Wayne,	18 00	20 00	1 00	1 25	22 50	25 00	1 50	2 00	2 25	40
Westmoreland,	15 50	20 00	75	1 15	23 50	27 50	1 25	1 50	2 00	40
Wyoming,	15 00	18 00	1 00	1 25	22 50	24 50	1 50	2 00	2 00	40
York,	13 00	15 00	70	1 00	20 00	22 00	1 10	1 30	1 50	30
Average,	$12 90	$16 35	$0 83	$1 10	$19 30	$22 36	$1 17	$1 46	$1 87	$0 34

PRICES OF FARM PRODUCTS, MAY, 1888.

COUNTIES.	Wheat per bushel.	Corn per bushel.	Rye per bushel.	Oats per bushel.	Potatoes per bushel.	Hay (clover) per ton.	Hay (timothy) per ton.	Butter per pound.	Chickens (dressed) per pound.
Adams,	$0 85	$0 57	$0 60	$0 80	$0 65	$7 50	$9 50	$0 18	$0 08
Allegheny,	1 00	65	90	42	1 00	10 00	15 00	33	12
Armstrong,	94	60	60	43	1 00	8 25	9 75	21	9
Beaver,	98	65	70	45	1 00	9 00	10 00	33	12
Bedford,	95	50	60	36	1 00	5 75	8 50	18	6
Berks,	95	60	65	40	60	11 00	13 00	24	12
Blair,	90	65	55	45	1 20	15 00	18 00	28	12
Bradford,	1 00	65	60	45	70	9 00	10 00	19	7
Bucks,	1 00	75	75	45	90	12 00	15 00	30	16
Butler,	92	60	58	43	94	9 00	11 00	20	8
Cambria,	1 00	65	80	50	1 00	10 00	12 00	25	16
Cameron,	1 00	70	80	60	1 10	12 00	15 00	18	10
Carbon,	90	60	57	41	91	10 00	12 00	25	9
Centre,	90	50	56	35	80	8 00	10 00	25	8
Chester,	97	62	60	42	83	10 00	12 00	27	11
Clarion,	90	70	75	42	95	13 00	14 00	28	7
Clearfield,	90	75	75	50	1 10	11 50	13 00	30	18
Clinton,	95	55	60	36	80	8 00	10 00	20	13
Columbia,	93	60	65	40	70	11 00	13 00	24	. . .
Crawford,	95	65	60	45	1 00	8 00	9 00	17	10
Cumberland,	90	55	70	35	70	8 00	10 00	20	9
Dauphin,	90	50	65	35	70	10 00	12 00	20	11
Delaware,	95	65	70	45	1 00	15 00	18 00	35	15
Elk,	97	65	74	58	1 00	10 00	11 50	28	11
Erie,	90	58	57	40	75	7 50	9 50	20	. . .
Fayette,	90	66	60	38	1 00	10 00	12 00	28	10
Forest,	98	65	68	59	95	9 50	11 00	18	8
Franklin,	92	56	70	33	75	8 00	9 00	16	10
Fulton,	90	66	65	33	75	6 75	7 50	17	9
Greene,	90	67	62	37	90	9 00	11 00	20	10
Huntingdon,	90	80	60	30	80	11 00	11 00	20	. . .
Indiana,	93	60	58	35	90	10 00	11 00	19	. . .
Jefferson,	88	60	75	50	1 00	10 00	12 00	25	7
Juniata,	88	60	60	32	65	8 00	10 00	20	10
Lackawanna,	90	65	65	50	90	12 00	14 00	28	14
Lancaster,	90	60	68	32	50	10 00	12 00	25	11
Lawrence,	90	60	50	35	1 00	10 00	12 00	18	6
Lebanon,	1 00	60	65	38	65	12 00	14 00	20	12
Lehigh,	98	59	66	39	67	11 50	12 50	21	10
Luzerne,	90	58	60	51	1 00	13 50	15 00	24	12
Lycoming,	1 00	68	70	40	85	12 00	15 00	25	14
McKean,	1 00	50	75	48	1 00	10 00	12 00	25	12
Mercer,	92	59	58	36	95	10 00	11 00	19	8
Mifflin,	95	65	60	32	1 00	10 00	12 00	20	9
Monroe,	97	78	70	37	84	10 00	11 50	18	8
Montgomery,	1 00	70	60	48	75	9 00	11 00	20	14
Montour,	97	59	54	33	70	9 50	11 25	18	12
Northampton,	1 00	70	75	40	75	12 00	16 00	27	14
Northumberland,	98	60	60	40	60	10 00	12 00	22	15
Perry,	85	50	55	30	65	8 00	11 00	18	10
Philadelphia,	97	75	65	50	75	18 00	20 00	35	20
Pike,	1 00	75	75	40	80	14 00	14 00	25	12
Potter,	95	60	70	34	90	9 75	10 50	19	10
Schuylkill,	97	59	58	40	72	10 00	11 50	20	16
Snyder,	90	60	61	35	70	9 00	11 00	19	11
Somerset,	92	70	70	45	80	8 00	9 50	16	10
Sullivan,	90	55	60	50	1 00	8 00	10 00	25	10
Susquehanna,	1 10	75	80	50	1 00	10 00	12 00	22	12
Tioga,	1 00	60	60	50	80	10 00	12 00	25	12
Union,	98	60	65	38	65	9 00	11 00	25	9
Venango,	1 00	70	75	43	1 00	12 00	15 00	25	13
Warren,	1 00	70	80	50	90	8 50	10 00	28	10
Washignton,	1 00	55	60	35	1 00	11 00	14 50	24	12
Wayne,	1 00	65	75	50	1 00	8 00	9 50	20	. . .
Westmoreland,	95	65	75	40	1 00	10 00	12 50	22	9
Wyoming,	90	70	70	40	80	6 50	7 50	22	12
York,	92	52	62	40	75	8 50	10 50	28	8

PRICES OF FARM PRODUCTS, NOVEMBER, 1888.

COUNTIES.	Wheat per bushel.	Corn per bushel.	Rye per bushel.	Oats per bushel.	Potatoes per bushel.	Hay (clover) per ton.	Hay (timothy) per ton.	Butter per pound.	Chickens (dressed) per pound.
Adams,	$1 03	$0 45	$0 56	$0 28	$0 30	$6 50	$9 75	$0 20	$0 9
Allegheny,	1 12	50	65	32	45	11 00	14 00	30	12
Armstrong,	1 04	48	59	30	40	9 50	11 00	27	9
Beaver,	1 14	50	65	35	40	10 00	14 00	30	10
Bedford,	1 08	50	65	35	30	6 50	9 50	20	9
Berks,	1 12	55	63	33	40	11 00	13 00	20	10
Blair,	1 03	65	70	38	38	8 75	11 50	25	11
Bradford,	1 20	60	60	35	30	10 00	13 50	22	10
Bucks,	1 15	60	62	35	55	10 00	12 00	30	12
Butler,	1 03	58	61	32	40	8 75	10 25	20	9
Cambria,	1 15	60	75	50	45	9 00	12 50	22	12
Cameron,	1 20	70	75	48	40	10 00	13 00	30	12
Carbon,	1 07	48	60	32	40	10 00	12 00	28	9
Centre,	1 00	50	60	30	30	8 75	10 50	24	10
Chester,	1 05	70	51	32	42	12 00	15 00	30	12
Clarion,	1 15	70	70	40	35	11 00	12 00	20	9
Clearfield,	1 05	70	70	50	48	10 00	11 00	30	12
Clinton.	1 10	53	56	32	45	8 25	11 00	25	10
Columbia,	1 10	60	60	35	35	10 00	12 00	22	10
Crawford,	1 00	55	80	30	28	8 00	10 00	20	10
Cumberland,	1 00	42	60	30	35	8 00	10 00	19	10
Dauphin,	1 10	55	65	37	48	9 75	11 50	27	10
Delaware,	1 10	55	70	40	60	12 00	14 50	38	14
Elk,	1 04	48	67	32	40	9 75	11 50	30	9
Erie,	1 05	50	60	31	35	9 00	10 50	28	8
Fayette,	1 02	49	60	30	32	8 75	10 50	20	8
Forest,	1 03	47	58	31	30	9 00	11 00	20	7
Franklin,	1 02	45	56	32	33	9 00	10 00	18	8
Fulton,	1 00	50	58	30	30	9 75	11 00	20	9
Greene,	1 07	45	60	34	37	10 00	11 00	19	9
Huntingdon,	1 05	45	56	30	35	10 50	11 00	20	9
Indiana,	1 10	46	54	30	37	9 00	11 00	19	9
Jefferson,	1 10	55	60	29	37	10 00	12 00	20	8
Juniata,	1 02	50	50	28	31	8 50	10 25	20	10
Lackawanna,	1 05	50	56	40	48	12 75	15 00	22	12
Lancaster,	1 05	50	56	28	35	11 00	14 00	20	12
Lawrence,	1 07	52	55	30	37	10 00	12 00	18	9
Lebanon,	1 05	56	58	32	40	10 00	12 50	20	9
Lehigh.	1 15	60	65	40	45	12 00	14 50	24	12
Luzerne,	1 10	62	65	40	47	12 00	14 00	25	12
Lycoming,	1 15	55	60	35	40	13 00	15 00	24	13
McKean,	1 15	60	70	40	40	8 75	11 25	24	10
Mercer,	1 10	54	60	32	35	9 00	10 00	25	7
Mifflin,	1 07	50	55	33	35	10 00	12 00	20	19
Monroe,	1 05	55	55	32	37	10 00	12 00	20	9
Montgomery,	1 15	60	75	40	57	14 00	16 00	27	15
Montour,	1 05	50	65	40	35	10 00	12 00	20	9
Northampton,	1 15	57	65	35	50	12 00	14 00	24	15
Northumberland,	1 10	50	60	32	35	12 00	14 00	20	10
Perry.	1 05	55	57	30	30	9 00	11 00	26	8
Philadelphia,	1 15	60	75	42	45	13 00	18 00	30	15
Pike,	1 00	65	60	40	43	12 00	12 50	24	12
Potter.	1 02	60	65	40	43	9 00	11 00	18	9
Schuylkill,	1 10	65	68	40	45	11 00	13 00	24	11
Snyder,	1 00	50	50	32	37	12 00	14 50	18	8
Somerset,	1 07	50	64	30	30	9 00	11 00	23	10
Sullivan,	1 10	60	65	40	40	8 75	12 50	20	12
Susquehanna,	1 02	50	60	37	35	9 00	11 00	18	9
Tioga,	1 10	60	72	40	35	8 00	10 25	20	12
Union,	1 10	50	55	32	40	10 00	12 00	22	10
Venango,	1 15	50	60	35	40	8 00	10 00	25	12
Warren,	1 10	50	55	30	30	8 00	9 00	20	10
Washington,	1 10	57	59	34	37	9 50	11 00	22	11
Wayne,	1 04	55	56	31	37	9 75	11 50	18	9
Westmoreland,	1 05	60	55	36	40	12 00	14 00	24	8
Wyoming,	98	60	60	40	45	8 00	9 75	23	10
York,	1 07	60	60	40	38	10 00	11 00	25	13

LIST OF COUNTY AND LOCAL AGRICULTURAL SOCIETIES,

With Names and Addresses of Secretaries and Dates for holding Fall Exhibitions of 1888 (both days included), compiled from official reports and sources by the Pennsylvania Board of Agriculture.

Those marked with an * are represented in the Board of Agriculture by elected members.

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where held.	When held.
	PENNSYLVANIA STATE AGRICULTURAL SOCIETY,	D. W. Seiler, Harrisburg,	Philadelphia,	September 3-15.
	STATE HORTICULTURAL ASSOCIATION,	E. B. Engle, Waynesboro',	Holds no fair.	
	TRI-STATE EXPOSITION,	R. H. Thomas, Mechanicsburg,	Williams Grove,	August 27-Sept. 1.
Armstrong,*	Armstrong County Agricultural Society,	T. W. Hill, Kittanning,	Kitttanning,	September 19-21.
Do.	Dayton Agricultural and Mechanical Association,	J. A. Morrow, Dayton,	Dayton,	September 25-28.
Do.	Petroleum Agricultural Society,	R. Balf, Parker's Landing,	Parker's Landing,	September 18-21.
Beaver,*	Beaver County Agricultural Society,	A. J. Lawrence, Beaver,	Beaver,	September 25-28
Do.	Mill Creek Valley Agricultural Association,	W. S. Stevenson, Hookstown,	Hookstown,	August 22-24.
Bedford,*	Bedford County Agricultural Society,	J. S. Gilchrist, Bedford,	Bedford,	September 18-21.
Berks,*	Berks County Agricultural and Horticultural Society,	C. T. Fox, Reading,	Reading,	No fair.
Do.	Keystone Agricultural Society,	S. H. Heffner, Kutztown,	Kutztown,	October 3-5.
Blair,*	Blair County Agricultural Society,	M. A. Young, Hollidaysburg,	Hollidaysburg,	September 11-14.
Bradford,*	Bradford County Agricultural Society,	J. H. Codding, Towanda,	Towanda,	September 25-27.
Do.	Union Agricultural Association,	C D. Derrah, Canton,	Canton,	September 4-6.
Do.	Troy Farmers' Club,	G. M. Card, Sylvania,	Troy,	September 4-7.
Bucks,*	Doylestown Agricultural and Mechanical Institute,	J. E. Zorns, Doylestown,	Doylestown,	October 3-6.
Butler,*	Butler County Agricultural Society,	W. P. Roessing, Butler,	Butler,	September 11-14.
Cambria,	Cambria County Agricultural Society,	P. J. Dietrick, Carrolltown,	Carrolltown,	September 18-21.
Carbon,	Carbon County Industrial Society,	E. Baur, East Mauch Chunk,	Lehighton,	October 2-5.
Chester,*	Chester County Agricultural Society,	A. M. Eachus, West Chester,	West Chester,	September 20-22.
Do.*	Oxford Agricultural Society,	D. E. Brinton, Oxford,	Oxford,	September 26-28.
Do.	Phœnixville Agricultural Society,	I. J. Tustin, Phœnixville,	Phœnixville,	No fair.
Clarion,*	Clarion County Agricultural Society,	J. H. Patrick, Clarion,	Clarion,	September 25-28.

Clearfield,	Clearfield County Agrcultural Society,	R. N. Shaw, Clearfield,	Clearfield,	No report.
Clinton,*	Clinton County Agricultural Society,	J. C. McCloskey, Lock Haven,	Holds no fair.	
Columbia,*	Columbia County Agricultural Society,	H. V. White, Bloomsburg,	Bloomsburg,	October 10-13.
Do.	Noth'n Columbia and South'n Luzerne Agric. Society,	J. W. Kurtz, Berwick,	Berwick,	September 12-15.
Do.	Benton Agricultural Society,	H. O McHenry, Benton,	Benton,	October 3-6.
Crawford,*	Crawford County Agricultural Society,	A. J. Harper, Conneautville,	Conneautville,	September 18-21.
Do.	French Creek Valley Agricultural Society,	J. H. Adams, Cochranton,	Cochranton,	September 12-14
Do.	Oil Creek Valley Agricultural Society,	A. B. Kerr, Centreville,	Titusville,	September 18-21.
Do.	Woodcock Fair Association,	A. W. Spaulding, Venango,	Woodcock,	September 19-21.
Do.	Central Crawford Agricultural Society,	M. Wilbur, Cambridge,	Cambridge,	September 5-7.
Cumberland,*	Cumberland County Agricultural Society,	E. B. Watts, Carlisle,	Carlisle,	September 25-28.
Dauphin,	Gratz Agricultural Society,	J. W. Hoffman, Gratz,	Gratz,	September 11-15.
Delaware,*	Delaware County Agricultural Society,	H. C. Snowden, Media,	Elwyn,	No report.
Elk,	Elk County Agricultural Society,	I. H. Gifford, St. Mary's,	St. Mary's,	October 9-12.
Erie,*	Erie County Agricultural Society,	W. H. Luce, Erie,	Erie,	September 18-21.
Do.	North-Western Agricultural Association,	N. Stone, Corry,	Corry,	September 11-14.
Do.	Wattsburg Agricultural Society,	D. B. Foote, Wattsburg,	Wattsburg,	September 25-28.
Do.	Edinboro' Agricultural Society,	C. O. Scrafford, Edinboro',	Edinboro',	September 11-14.
Fayette,	Fayette County Agricultural Association,	R. F. Hopwood, Uniontown,	Uniontown,	October 2-5.
Fulton,	Fulton County Agricultural Society,	J. W. Greathead, McConnellsburg,	McConnellsburg,	Not selected.
Greene,	Greene County Agricultural Society,	L. W. Gwynn, Carmichael,	Carmichaels,	September 25-27.
Do.	Waynesburg Agricultural Society,	R. F. Downey, Waynesburg,	Waynesburg,	September 11-13.
Indiana,*	Indiana County Agricultural Society,	J. T. Stuckel, Indiana,	Indiana,	October 2-5.
Jefferson,*	Jefferson County Agricultural Society,	S. H. Whitehill, Brookville,	Brookville,	September 11-14.
Do.	Punxsutawney Agricultural Society,	T. J. Cooper, Punxsutawney,	Punxsutawney,	September 18-21.
Juniata,*	Juniata County Agricultural Society,	M. R. Wharton, Port Royal,	Port Royal,	September 25-28.
Lackawanna,*	Lackawanna County Agricultural Society,	D. M. Jones, Scranton,	Scranton,	September 18-21.
Do.	North Lackawanna Farmers' Association,	J. L. Stone, Waverly,	Holds no fair.	
Lancaster,*	Lancaster County Agricultural Society,	J. C. Linvill, Gap,	Lancaster,	Holds no fair.
Do.	Lancaster County Fair Association,	B. F. Montgomery, Lancaster,	Lancaster,	September 17-22.
Do.	Farmers' Fair Association,	J. F. Bomberger, Lititz,	Lititz,	No fair.
Lebanon,*	Lebanon Valley Agricultural and Mechanical Asso.,	C. R. Lantz, Lebanon,	Lebanon,	September 25-28.
Lehigh,*	Lehigh County Agricultural Society,	L. P. Hecker, Allentown,	Allentown,	September 24-28.
Luzerne,*	Luzerne County Agricultural Society,	J. A. Law, Pittston,	Wyoming,	September 25-28.
Do.	Dallas Union Agricultural Society,	C. H. Hall, Dallas,	Dallas,	October 2-5.
Lycoming,*	Muncy Valley Farmers' Club Agricultural Society,	E. Michael, Hughesville,	Hughesville,	October 3-7.
McKean,	McKean County Agricultural Society,	B. C. Gallup, Port Allegheny,	Port Allegheny,	September 13-15.
Mercer,	Mercer County Agricultural Society,	J. P. Hines, Stoneboro',	Stoneboro',	September 25-27.
Do.*	Mercer Central Agricultural Society,	W. J. McKean, Mercer,	Mercer,	September 10-12.

COUNTY AND LOCAL AGRICULTURAL SOCIETIES—Continued.

COUNTY.	Corporate Name of Society.	Name and Address of Secretary.	Where held.	When held.
Monroe,	Monroe County Agricultural Society,	R. B. Keller, Stroudsburg,	Stroudsburg,	September 25-29.
Montgomery,*	Montgomery, Chester and Berks Agricultural Society,	E. P. Ancona, Pottstown,	Pottstown,	September 25-28.
Montour,*	Montour County Agricultural Society,	W. B. Baldy, Danville,	Danville,	September 12-15.
Do.	Northern Montour Agricultural Society,	C. E. Shires, Washingtonville,	Washingtonville,	October 16-19.
Northampton,*	Northampton County Agricultural Society,	E. T. Grunewald, Nazareth,	Nazareth,	October 2-5.
Do.	Farmers' and Mechanics' Institute,	Thomas Rinek, Easton,	Easton,	September 11-15.
Northumberland,*	Milton Driving Park and Fair Association,	M. H. Barr, Milton,	Milton,	September 5-8.
Perry,*	Perry County Agricultural Society,	J. B. Eby, Newport,	Newport,	September 18-21.
Potter,	Potter County Agricultural and Horticultural Society,	C. L Peck, Coudersport,	Coudersport,	No report
Schuylkill,*	Schuylkill County Agricultural Society,	R. S. Fey, Orwigsburg,	Orwigsburg,	October 2-5
Do.	Ringtown Agricultural Society,	I. Applegate, Shenandoah,	Ringtown,	September 12-14
Sullivan,*	Sullivan County Agricultural Society,	A. D. Strong, Dushore,	Forksville,	No report.
Susquehanna,*	Susquehanna County Agricultural Society,	D. A. Titsworth, Montrose,	Montrose,	September 12-13.
Do.	Harford Agricultural Society,	L. Tiffany, Harford,	Harford,	September 26-27.
Do.	Keystone Agricultural Society,	J. W. Dusenbury, Great Bend,	Great Bend,	No report.
Tioga,*	Farmers' Agricultural Society of Tioga County,	J. W. Mather, Wellsboro',	Wellsboro',	September 11-14.
Do.	Tioga County Agric. and Mechanical Industrial Asso.,	J. A. Elliott, Mansfield,	Mansfield,	September 25-28.
Union,*	Union County Agricultural Society,	R. S. Kline, Lewisburg,	Lewisburg,	September 4-7.
Venango,*	Venango County Agricultural Society,	J. Miller, Franklin,	Franklin,	September 4-7.
Warren,*	Warren County Agricultural Association,	A. S. Dalrymple, Warren,	Warren,	September 18-21.
Washington,*	Western Pennsylvania Agricultural Association,	A. G. Happer, Washington,	Washington,	September 4-7.
Do.	Union Agricultural Association,	W. Melvin, Burgettstown,	Burgettstown,	October 2-4.
Wayne,*	Wayne County Agricultural Society,	T. J. Ham, Honesdale,	Honesdale,	No fair.
Westmoreland,*	Westmoreland County Agricultural Society,	J. S. Sell, Greensburg,	Greensburg,	September 18-21.
Wyoming,*	Wyoming County Agricultural Society,	J. W. Platt, Tunkhannock,	Tunkhannock,	September 12-14.
York,*	York County Agricultural Society,	E. Chapin, York,	York,	October 2-5.
Do.	Hanover Agricultural Society,	M. O. Smith, Hanover,	Hanover,	September 18-21.

TABULATED ANALYSES OF COMMERCIAL FERTILIZERS.

Made by the Pennsylvania State Board of Agriculture.

From samples selected by the Secretary of the Board, or its agents, in accordance with the provisions of the act of June 28th, 1879. Analyses by Prof. F. A. GENTH, University of Pennsylvania, West Philadelphia. Valuations are based upon an allowance of 8 cents per pound for soluble and reverted phosphoric acid; 5 cents for insoluble phosphoric acid from bone, 4 cents unmixed fertilizers which derive it mainly from tankage, fish, etc., and 3 cents when derived from South Carolina Rock; potash, 5 cents, and ammonia, 17 cents per pound.

It should be remembered that the column of "Comparative Commercial Value" is obtained by multiplying the number of pounds of each element in a ton, by the market price per pound in the market *at the commencement of the fertilizer year, August 1st*; hence, this column makes no allowance for mixing, freight, commissions, or variations in value during the year.

Complete Fertilizers.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Potash.	Ammonia.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Number.
244	Swift Sure Phosphate, ...	M. L. Shoemaker Co., Philadelphia, Pa., . . .	Philadelphia, .	Mch. 20, '88	8.26	4.23	2.86	5.50	3.99	$41 34	$34 00	244
247	Wheat, Corn and Oats Fertilizer, . . .	Dambmann Bros. & Co., Baltimore, Md., ...	" .	"	7.39	2.12	1.34	2.38	3.10	29 21	35 00	247
249	Twenty-five Dollar Phosphate, . . .	Baugh & Son's Company, Philadelphia, Pa., . . .	" .	Mch. 31, '88	6.77	2.80	2.91	0.21	2.82	27 44	25 00	249
250	Swift Sure Guano, ...	M. L. Shoemaker Company, Philadelphia, Pa., .	" .	"	0.45	8.25	8.24	0.21	7.57	46 46	28 00	250
252	Tampico Guano, ...	Sharpless & Carpenter, Philadelphia, Pa., ...	" .	"	6.44	2.52	2.17	2.85	3.64	31 31	38 00	252
253	Truckers Triumph Guano, ...	J. E. Tygert & Co., Philadelphia, Pa., ...	" .	"	5.80	2.70	1.86	7.41	4.20	36 78	40 00	253
254	Wando Blood Phosphate, ...	Wando Phosphate Company, Charleston, S. C., .	" .	"	8.15	2.51	3.67	1.37	3.11	31 94	30 00	254
255	Lobos Peruvian Guano, ...	Christian & Co., Philadelphia, Pa., ...	" .	"	5.50	2.47	16.95	5.35	5.32	49 81	44 00	255
258	Swift Sure Dissolved Bone, ...	M. L. Shoemaker Company, Philadelphia, Pa., .	" .	Apr. 7, '88	8.72	5.60	5.00	. . .	3.56	39 02	34 00	258
259	Star Bone Phosphate, ...	J. E. Tygert & Co., Philadelphia, Pa., ...	" .	"	8.27	2.56	0.81	2.93	2.47	29 31	28 00	259
260	No. 1 Bone Phosphate, ...	Sharpless & Carpenter, Philadelphia, Pa., ...	" .	"	5.87	4.05	3.10	1.80	1.74	26 07	25 00	226
261	Echo Phosphate, ...	M. L. Shoemaker Company, Philadelphia, Pa., .	" .	"	7.91	3.35	4.09	1.62	1.90	29 37	25 00	261
262	Star Guano, ...	J. E. Tygert & Co., Philadelphia, Pa., ...	" .	"	7.20	2.00	1.16	3.16	2.74	28 13	28 00	262
263	Dissolved Bone Phosphate, ...	Sharpless & Carpenter, Philadelphia, Pa., ...	" .	"	9.74	3.25	2.03	0.30	2.57	31 44	33 00	263
266	Dissolved Animal Bone, ...	Baugh & Sons' Company, Philadelphia, Pa., . .	" .	"	12.55	2.81	2.58	. . .	4.03	40 34	34 00	266
270	Raw Bone Phosphate, ...	" " " " . .	" .	"	6.81	4.39	4.20	0.28	3.47	33 36	32 00	270
271	Twenty-three Dollar Phosphate, . . .	M. L. Shoemaker Company, Philadelphia, Pa., .	" .	"	8.14	3.10	4.14	1.59	1.97	29 58	23 00	271
275	Standard Phosphate, ...	H. S. Miller & Co., Newark, N. J., ...	York, ...	"	10.59	0.64	0.10	3.18	4.10	35 17	32 00	275
276	Ammoniated Dissolved Bone, ...	" " "	"	"	5.56	6.79	2.16	3.10	3.28	35 74	30 00	276
277	Harvest Queen, ...	" " "	"	"	10.29	2.18	0.81	2.31	2.91	32 72	27 00	277

COMPLETE FERTILIZERS—Continued.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Potash.	Ammonia.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Number.
278	Ammoniated Bone Phosphate, ...	D. D. Hess & Son, Reading, Pa., ...	Tuckerton, . . .	Apr. 7,'88	9.59	2.16	1.73	2.37	3.00	$32 75	$31 00	278
279	Keystone Bone Phosphate, ...	" " "	" . . .	"	10.83	2.70	1.79	1.16	1.71	30 05	26 00	279
280	Ammoniated Bone Phosphate, ...	Crocker Fertilizer Company, Buffalo, N. Y., . .	West Chester, .	Apr. 13,'88	8.80	2.23	1.09	0.99	4.16	32 85	35 00	280
281	Dissolved Animal Bone.	Dambmann Bros. & Co., Baltimore, Md., ...	" .	"	10.21	7.69	1.54	. . .	2.81	39 42	34 00	281
283	Sure Crop Bone Phosphate, ...	Bowker Fertilizer Company, Boston, Mass., . . .	Apollo, ...	"	7.87	3.41	5.99	0.64	2.84	33 14	28 00	283
284	Hill and Drill Phosphate, ...	" " " " . . .	"	"	8.65	3.38	3.58	0.82	2.51	31 38	35 00	284
285	Garden City Phosphate, ...	N. W. Fertilizing Company, Chicago, Ill., ...	"	"	5.80	3.59	5.85	0.32	2.53	28 22	33 00	285
287	Eagle Phosphate, ...	W. Diebert & Co., Johnstown, Pa., ...	Johnstown, . .	"	2.32	4.33	3.86	2.08	1.85	22 10	25 00	287
288	Johnstown Fertilizer, ...	" " "	" . .	"	2.53	4.05	4.98	2.06	3.58	28 70	29 00	288
289	Challenge Corn Guano, ...	N. W. Fertilizing Company, Chicago, Ill., ...	" . .	"	5.44	4.32	5.56	0.80	3.15	30 91	35 00	289
290	Ammoniated Dissolved Bone, ...	" " " "	" . .	"	5.80	4.29	5.13	0.40	3.04	30 98	35 00	290
294	D. B. Sea Fowl Guano, ...	Bradley Fertilizer Company, Boston, Mass., . . .	Greensburgh . .	Apr. 13,'88	9.42	2.10	1.76	1.02	3.39	32 39	36 00	294
295	Ammoniated Wheat Phosphate, . . .	Crocker Fertilizer Company, Buffalo, N. Y., . .	" . .	"	9.07	2.67	1.10	1.70	3.24	32 38	34 00	295
296	Bone Fertilizer, ...	I. S. Yarnall, Media, Pa., ...	Media, ...	"	8.77	3.22	0.47	2.28	1.96	28 50	30 00	296
297	Ammoniated Diss. Bone and Potash,	J. Taylor & Co., Trenton, N. J., ...	Summit, ...	"	7.98	2.94	2.55	2.71	1.80	27 88	27 00	297
298	Complete Fertilizer for Potatoes, . .	" " "	"	"	8.22	2.98	1.48	10.83	3.77	41 79	45 00	298
296	Complete Fertilizer for Truck, . . .	" " "	"	"	8.78	3.09	2.74	4.86	2.58	34 73	36 00	299
303	Tip Top Bone Phosphate, ...	I. P. Thomas & Son, Philadelphia, Pa., ...	Concord, ...	Apr. 18,'88	7.70	3.72	1.68	2.84	3.08	32 88	36 00	303
304	Normal Phosphate, ...	" " "	"	"	6.91	3.45	1.61	1.27	1.39	23 97	25 00	304
306	Ammoniated Bone Phosphate, ...	J. Cope & Co., Lincoln University, Pa., ...	Summit, ...	"	6.25	3.76	4.04	1.04	1.60	24 12	28 00	306
307	Pure Bone Phosphate, ...	" " " "	"	"	4.10	6.61	3.81	2.50	2.90	32 84	34 00	307
308	Economical Fertilizer, ...	Baugh & Sons' Company, Philadelphia, Pa., . . .	Media, ...	"	8.97	4.38	2.65	2.29	2.53	26 37	28 00	308
309	Potato Grower, ...	N. W. Fertilizing Company, Chicago, Ill., ...	Pittsburgh, . . .	"	4.96	6.06	2.41	2.08	3.78	34 32	36 00	309
310	Forest City Bone Phosphate, ...	Cleveland Dryer Company, Cleveland, Ohio, . .	" . . .	"	8.28	2.96	3.14	0.16	2.96	30 71	33 00	310
311	Square Bone, ...	" " " . .	" . . .	Apr. 21,'88	2.56	6.12	6.52	0.82	2.47	27 88	33 00	311
312	Ammoniated Dissolved Bone, ...	Bowker Fertilizer Company, Boston, Mass., . . .	" . . .	"	7.87	2.98	4.17	1.84	2.12	29 67	34 00	312
313	Manure for Potatoes, ...	Mapes Formula Company, New York, ...	" . . .	"	4.94	4.26	4.49	7.77	5.14	43 66	47 00	313
315	Prairie Phosphate, ...	N. W. Fertilizing Company, Chicago, Ill., ...	" . . .	"	5.89	3.52	5.46	0.27	2.31	27 55	30 00	315
319	Try Me Bone Phosphate, ...	J. Cope & Co., Lincoln University, Pa., ...	Kennett Square,	"	5.81	2.87	2.80	3.58	1.95	25 54	26 00	319
321	Orchilla Guano, ...	R. A. Wooldridge & Co., Baltimore, Md., ...	Toughkenamon,	Apr. 28,'88	0.06	3.72	13.00	0.14	0.24	17 41	22 00	321
322	Victor Bone Phosphate, ...	N. J. Chemical Company, Philadelphia, Pa., . .	Avondale, . . .	"	1.64	6.00	1.37	2.40	1.87	20 38	25 00	322
323	Ammoniated Wheat and Oats Phos.,	Crocker Fertilizer Company, Buffalo, N. Y., . .	" . . .	"	9.43	2.22	0.68	2.02	3.18	31 97	33 00	323
324	New Rival Phosphate, ...	" " " . .	" . . .	"	8.74	2.54	0.94	2.20	2.09	28 11	30 00	324
326	Q. and L. Ammoniated Phosphate, .	Waring Fertilizer Company, Colora, Md., ...	Kelton, ...	"	7.59	2.43	4.10	2.22	2.59	30 42	25 00	326
327	Pure Dissolved Bone, ...	" " "	"	"	8.95	5.84	4.78	. . .	2.38	35 53	28 00	327

330	Whann Bros. Raw Bone Phosphate,	J. A. Cranston & Co., Newport, Del.,	"	May 5, '88	7.53	2.11	1.87	2.01	5.14	36 41	30 00	330
331	Potato Phosphate,	Susquehanna Fertilizer Co., Baltimore, Md.,	"	"	7.90	3.17	1.63	3.13	1.68	27 85	25 00	331
332	Potato Phosphate,	Henry Cope & Co., Lincoln University, Pa.,	Elkview,	"	6.66	2.84	1.42	2.21	2.98	28 68	30 00	332
335	Ammoniated Bone Phosphate,	" " "	Oxford,	"	6.99	4.28	3.49	2.45	1.51	28 40	25 00	335
338	Cereal Bone Phosphate,	Oakford & Small, York, Pa.,	"	"	7.85	4.78	2.00	0.96	0.83	25 59	23 00	338
339	Potato Fertilizer,	" " "	"	"	6.21	3.89	1.03	3.56	0.88	23 53	28 00	339
341	Ammoniated Bone Phosphate,	" " "	"	"	7.28	2.97	1.11	1.61	2.24	26 52	30 00	341
343	Potato Special Phosphate,	Walker, Stratman & Co., Pittsburgh, Pa.,	Pittsburgh,	Apr. 28, '88	5.28	3.54	3.90	1.21	2.84	28 10	30 00	343
344	Bone and Meat Fertilizer,	" " "	"	"	0.40	3.16	13.38	0.89	3.58	37 38	29 00	344
345	Four-Fold Fertilizer,	" " "	"	"	6.36	3.83	1.63	0.87	2.63	26 91	26 00	345
346	Big Bonanza Fertilizer,	" " "	"	"	7.68	1.99	2.05	0.87	2.50	26 48	31 00	346
348	Shamrock Phosphate,	Shamrock Fertilizer Co., Mansfield Valley, Pa.,	Mansfield Valley	"	6.14	3.13	3.63	2.98	3.64	33 09	35 00	348
349	Potato Manure,	" " "	"	"	5.91	3.54	3.04	5.27	3.77	35 64	40 00	349
350	Raw Bone Phosphate,	Allegheny City Fertilizer Co., Allegheny, Pa.,	Allegheny City,	May 5, '88	2.68	6.82	4.80	1.06	6.43	41 78	35 00	350
354	Royal Bone Phosphate,	Williams, Clark & Co., New York,	Harmansville,	"	7.04	2.42	1.06	1.59	3.48	29 41	30 00	354
355	Prolific Crop Producer,	" " "	Harmansville,	May 5, '88	6.90	0.06	0.33	1.82	2.37	21 28	26 00	355
356	Potato Phosphate,	" " "	"	"	6.80	1.10	0.29	6.04	3.28	30 06	38 00	356
358	Grade No. 1 Fertilizer,	Cumberland County Fertilizer Co., Carlisle, Pa.,	Carlisle,	"	3.31	4.81	2.91	4.77	0.75	22 64	23 00	358
359	Dissolved Bone,	" " "	"	"	2.70	12.56	2.11	...	3.97	39 61	32 00	359
363	Pride of Ammoniated Phosphate,	Lorentz & Rittler, Baltimore, Md.,	Railroad,	Apr. 26, '88	4.16	3.70	2.32	2.18	2.34	24 53	23 00	363
364	Corn and Oats Bone Phosphate,	" " "	"	"	7.06	2.03	2.37	2.12	2.00	25 86	26 00	364
366	Success Phosphate,	Lister Agricultural Chemical Co., Newark, N. J.,	Mercer,	May 12, '88	8.14	5.10	1.16	1.58	2.27	31 86	32 00	366
367	Homestead Phosphate,	Michigan Carbon Works, Detroit, Mich.,	Greenville,	"	8.47	2.69	0.99	0.89	3.08	30 00	30 00	367
368	Jarves Drill Phosphate,	" " "	"	"	5.77	2.87	2.69	0.55	1.96	23 18	27 00	368
370	Erie City Fertilizer,	Schaal Brothers, Erie, Pa.,	Erie,	"	3.40	4.98	1.68	2.10	1.86	23 17	26 00	370
372	Superphosphate,	Jarecki Chemical Company, Erie, Pa.,	"	"	6.27	1.88	3.62	2.28	1.45	23 15	26 00	372
373	Lake Erie Fish Guano,	" " "	"	"	7.63	1.69	3.29	2.06	1.41	24 39	26 00	373
375	Trout Run Fertilizer,	J. C. Thornton & Son, Avonia, Pa.,	"	May 19, '88	7.92	3.92	1.77	2.27	2.25	29 57	24 00	375
376	Dissolved Bone and Potash,	Bradley Fertilizer Company, Boston, Mass.,	"	"	7.94	2.75	1.92	1.60	1.70	26 02	27 00	376
377	Fish Fertilizer,	A. Broezel, Erie, Pa.,	"	"	0.29	1.88	0.39	0.46	0.91	7 33	26 00	377
378	Soluble Pacific Guano,	Pacific Guano Company, Boston, Mass.,	"	"	6.08	5.37	0.75	2.97	3.81	34 84	37 00	378
380	Ammoniated Wheat and Corn Phos.,	Crocker Fertilizer Company, Buffalo, N. Y.,	Meadville,	"	9.05	1.87	0.48	4.06	3.11	31 68	30 00	380
381	Vegetable Bone Phosphate,	" " "	"	"	5.46	0.03	3.03	7.83	6.89	40 76	36 00	381
385	Acidulated Bone,	Cincinnati Desiccating Company, Cincinnati, O.,	"	"	3.16	10.57	7.58	...	4.99	47 00	36 00	385
386	Gilead Phosphate,	" " "	"	"	2.10	8.27	2.06	2.20	3.05	30 53	33 00	386
387	Ohio Valley Phosphate,	" " "	"	"	1.06	9.01	1.57	1.66	2.89	27 15	26 00	387
389	Old Virginia Compound,	Ramsburg Fertilizer Company, Frederick, Md.,	Littlestown,	"	8.01	2.45	3.05	1.41	1.69	26 74	26 00	389
390	Dissolved Animal Bone,	Zell Guano Company, Baltimore, Md.,	"	"	6.75	10.39	1.49	...	2.25	36 26	34 00	390
391	Harvest Queen Phosphate,	Lister Agricultural Chemical Works, Newark, N. J.	York,	"	12.11	1.66	0.25	2.71	3.91	38 23	27 00	391
394	Zell's Economizer,	Zell Guano Company, Baltimore, Md.,	Littlestown,	"	8.39	3.54	1.76	1.21	2.71	30 89	29 00	394
395	Whitelock's Vegetator,	Miller, Lippincott & Co., Baltimore, Md.,	York,	May 26, '88	9.72	2.90	1.96	1.19	2.66	31 99	30 00	395
396	Soluble Flour of Bone,	P. S. Chappell & Son, Baltimore, Md.,	"	"	6.20	3.08	0.98	1.53	2.41	25 35	28 50	396
398	Ammoniated Dissolved Bone,	Lister Agricultural Chemical Works, Newark, N. J.	"	"	11.79	1.42	0.25	3.58	4.19	39 17	30 00	398
399	Ammoniated Bone Phosphate,	E. K. Bollinger & Co., Seitzland, Pa.,	"	"	7.53	3.13	0.90	0.68	2.16	25 80	28 00	399
400	Calvert Guano,	Zell Guano Company, Baltimore, Md.,	Littlestown,	"	9.08	4.08	0.91	1.01	1.09	26 42	26 00	400
401	Dissolved Bone,	C. H. Dempwolf & Co., York, Pa.,	York,	"	4.57	9.24	3.28	...	4.29	39 31	36 00	401
402	Ammoniated Phosphate;	P. S. Chappell & Son, Baltimore, Md.,	"	"	8.64	1.99	0.91	0.89	2.74	27 95	31 00	402
403	Tobacco Fertilizer,	Williams, Clark & Co., New York,	"	"	9.07	1.42	1.48	0.38	5.01	35 37	44 00	403
405	Ammoniated Bone and Potash,	C. H. Dempwolf & Co., York, Pa.,	"	"	5.72	2.28	4.13	2.38	1.57	23 72	20 00	405
406	Special Corn and Oats Fertilizer,	P. S. Chappell & Son, Baltimore, Md.,	"	"	2.65	6.60	2.39	2.21	0.26	19 80	22 00	406
409	Unicorn Ammoniated Phosphate,	Clark's Cove Guano Company, New York,	"	"	4.31	4.96	4.11	3.60	2.68	30 66	....	409
410	Standard Phosphate,	Lister Agricultural Chemical Works, Newark, N. J.	"	"	12.54	1.34	0.22	3.61	4.70	41 98	32 00	410

COMPLETE FERTILIZERS—Continued.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Potash.	Ammonia.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Number.
411	Ammoniated Bone Phosphate, ...	Susquehanna Fertilizer Company, Baltimore, Md.	Littlestown, . .	May 28, '88	6.27	3.23	5.06	1.72	1.75	$26 92	$29 00	411
413	Corn and Potato Fertilizer, ...	Ramsburg Fertilizer Company, Frederick, Md.,	" . .	"	6.72	2.97	3.74	1.60	1.35	24 68	25 00	413
414	Vegetable Fertilizer, ...	H. S. Miller & Co., Newark, N. J., ...	York, ...	"	10.00	1.58	0.47	8.89	4.05	41 57	42 00	414
415	Special Tobacco Fertilizer, ...	P. S. Chappell & Son, Baltimore, Md., ...	"	May 31, '88	6.04	2.22	0.95	2.85	2.10	23 96	31 00	415
417	Pen Mar Ammoniated Bone, ...	William Davison & Co., Baltimore, Md., ...	Hanover, ...	"	5.09	3.04	4.05	2.79	1.97	26 02	27 00	417
419	Lazaretto Crop Grower, ...	G. W. Griffin, Baltimore, Md., ...	"	"	7.16	2.12	2.39	1.19	2.30	26 67	27 00	419
423	Standard Bone Phosphate, ...	John Sholl, Hanover, Pa., ...	Hanover, ...	"	5.31	3.43	3.54	2.63	1.77	25 46	28 50	423
424	Ammoniated Bone Phosphate, ...	D. Blocher & Co., Gettysburg, Pa., ...	"	"	6.49	3.14	2.01	1.12	0.63	20 28	23 00	424
425	Soluble Bone Phosphate, ...	J. A. Livers, Gettysburg, Pa., ...	Gettysburg, . .	June 9, '88	2.41	7.65	4.67	0.47	. . .	18 45	19 00	425
426	York Ammoniated Bone Phosphate, .	A. R. Brodbeck, Hanover, Pa., ...	Hanover, ...	"	4.89	3.37	3.43	2.81	1.73	24 65	27 00	426
428	Farmer's Gold Dust Phosphate, . . .	J. A. Livers, Gettysburg, Pa.	Gettysburg, . .	"	7.45	3.37	1.97	0.73	1.65	25 23	28 00	428
429	Dissolved Bone and Potash, ...	D. Blocher & Co., Gettysburg, Pa., ...	" . .	"	9.67	2.85	2.34	0.99	2.13	30 13	32 00	429
431	Ammoniated Bone Phosphate, ...	J. Richmond, Philadelphia, Pa., ...	" . .	"	7.47	2.71	2.92	0.98	3.01	29 84	32 00	431
432	Azotized Bone Phosphate, ...	" "	" . .	"	6.46	3.49	2.71	1.51	2.35	27 59	30 00	432
433	Soluble Bone Phosphate, ...	" "	Hanover, ...	"	2.72	6.83	3.05	0.80	0.31	18 77	18 00	433
434	Excelsior Phosphate, ...	" "	Gettysburg, . .	"	9.57	1.54	0.91	5.84	4.61	40 02	39 00	434
437	Cook's Bone Phosphate, ...	Windle, Doan & Co., Coatesville, ...	Mortonville, . .	June 9, '88	7.38	4.65	2.71	2.04	2.58	32 23	35 00	437
438	Ammoniated Bone Phosphate, ...	" " "	" . .	"	6.43	4.16	3.81	1.85	3.47	35 34	28 50	438
440	Rose Bone Phosphate, ...	Equitable Fertilizer Company, Baltimore, Md., .	Coatesville, . .	June 14, '88	5.28	3.45	1.75	0.93	0.23	24 38	24 00	440
441	Equitable Fish Guano, ...	" " " .	" . .	"	2.26	9.28	2.02	0.95	2.23	28 53	29 00	441
442	Equitable Potato Compound, ...	" " " .	" . .	"	2.67	5.57	5.82	8.01	3.14	36 13	37 00	442
443	Esmaralda Natural Guano, ...	" " " .	" . .	"	5.82	4.08	3.10	1.65	4.18	34 18	42 00	443
446	Honeybrook Bone Phosphate, ...	E. J. Irwin, Honeybrook, Pa., ...	Glen More, . . .	June 14, '88	6.27	5.53	7.34	0.29	2.10	32 18	30 00	446
447	Pioneer Bone Phosphate, ...	J. G. Dowuward, Coatesville, Pa., ...	Springfield, . .	"	7.37	2.74	2.12	1.43	1.67	23 39	33 00	447
448	Poudrette, ...	Quaker City Poudrette Co., Philadelphia, Pa., .	Phœnixville, . .	"	0.85	3.65	0.36	0.20	1.91	14 18	23 00	448
451	Powhattan Wheat Fertilizer, ...	Lorentz & Rittler, Baltimore, Md., ...	Railroad, ...	May 11, '88	7.52	1.55	2.65	1.43	2.77	27 53	26 00	451
452	Potato and Fruit Fertilizer, ...	J. Richmond, Philadelphia, Pa., ...	Gettysburg, . .	"	5.22	3.66	1.66	7.27	2.10	30 11	29 00	452
453	Standard Bone Phosphate, ...	Fry Brothers, McCall's Ferry, Pa., ...	McCall's Ferry,	"	8.23	4.91	2.44	1.34	3.61	35 18	30 00	453
454	Ammoniated Bone Phosphate, ...	" " "	" . .	"	7.59	3.11	1.89	1.78	2.44	28 71	26 00	454
458	Bone Phosphate, ...	J. A. Cranston & Co., Newport, Del., ...	Oxford, ...	"	7.85	2.42	2.06	2.60	3.23	31 66	30 00	458
460	Farmers' Friend Phosphate, ...	Road & Co., New York, ...	Stillwater, . . .	May 19, '88	6.69	4.57	2.88	2.64	3.44	34 66	32 00	460
461	Lion Phosphate, ...	" "	" . . .	"	7.28	2.81	2.65	4.36	2.48	31 05	29 00	461
464	Good Crop Phosphate, ...	West Branch Fertilizer Co., Williamsport, Pa., .	Williamsport, .	May 25, '88	6.98	2.63	1.77	3.14	2.62	28 77	30 00	464
466	Alkaline Bone, ...	Bradley Fertilizer Company, Boston, Mass., . . .	Pottstown, . . .	June 14, '88	9.43	3.75	1.74	3.25	0.14	25 52	30 00	466
467	Tobacco Fertilizer, ...	Great Eastern Fertilizer Co., Rutland, Vt., . . .	Boyerstown, . .	"	6.93	1.83	1.06	4.36	2.80	28 75	. . . .	467

468	Eagle Bone Phosphate,	Bradley Fertilizer Company, Boston, Mass.,	Pottstown,	"	8.28	2.01	0.79	2.19	1.86	28 90	33 00	468
469	Champion Fertilizer,	Lord & Polk Co., Odessa, Del.,	Hamburg,	"	7.53	2.94	1.91	2.18	1.91	26 95	. .	469
473	Success Phosphate,	Lister Agricultural Chemical Works, Newark, N.J.	York,	June 9, '88	12.49	1.69	0.25	2.33	3.77	38 04	27 00	473
475	Potato Fertilizer No. 2,	" " " "	"	"	7.08	5.47	1:52	5.42	2.76	36 10	32 00	475
476	Eureka Fertilizer,	Acme Fertilizer Company, Roaring Spring, Pa.,	New Freedom,	June 14, '88	. . .	2.65	1.57	0.83	0.15	6 34	20 00	476
477	Acme Bone Phosphate,	" " " "	"	"	. . .	2.97	3.99	0.59	1.04	12 07	32 00	477
478	"AA" Phosphate,	W. Kenderdine, Lumberville, Pa.,	Doylestown,	July 4, '88	6.70	3.16	1.68	5.42	2.44	30 84	28 00	478
479	"AB" Phosphate,	" " "	"	"	7.84	4.10	1.79	4.76	1.98	31 22	33 00	479
480	B & H Bone Phosphate,	H. F. Hager, Richland Centre, Pa.,	Quakertown,	July 21, '88	5.05	5.29	2.48	2.72	2.17	28 62	35 00	480
481	Farmers' Favorite Phosphate,	" " "	"	"	4.67	4.17	2.80	2.79	2.45	27 50	25 00	481
483	Standard Phosphate,	Farmers' Fertilizer Co., Syracuse, N. Y.,	Bloomsburg,	Aug. 7, '88	7.93	2.88	1.52	3.46	3.80	33 19	32 00	483
484	Reaper Phosphate,	" " "	"	"	7.89	2.72	1.20	3.40	4.53	35 94	32 00	484
485	Onondago Chief Phosphate,	" " "	"	"	6.64	3.08	1.31	3.41	2.04	26 95	28 00	485
486	Western Reserve Fertilizer,	Jonathan Warner, Mineral Ridge, Ohio,	Scruhgrass,	"	. . . .	. . .	0.78	0.84	. . .	1 12	20 00	486
487	Old Virginia Compound,	Ramsburg Fertilizer Co., Frederick, Md.,	Dillsburg,	Aug. 16, '88	5.76	3.76	3.27	1.44	1.99	26 06	28 00	487
488	Excelsior Plant Food,	" " "	"	"	8.61	2.29	2.81	0.97	2.50	29 16	31 00	488
489	Ammoniated Bone,	" " "	"	"	7.69	4.98	3.24	0.35	1.51	28 84	26 00	489
490	Pride Ammoniated Phosphate,	Lorentz & Rittler, Baltimore, Md.,	Hanover,	Sep. 1, '88	4.48	3.56	4.27	2.16	1.76	24 84	28 00	490
493	Pen Mar Ammoniated Phosphate,	W. Davison & Co., Baltimore, Md.,	"	"	5.79	2.48	5.06	2.33	1.62	25 12	27 00	493
494	York Ammoniated Phosphate,	A. R. Brodbeck, Hanover, Pa.,	"	"	5.65	2.06	5.44	2.21	1.73	24 78	28 00	494
496	Economizer Phosphate,	Zell Guano Co., Baltimore, Md.,	"	"	8.28	4.80	2.50	3.17	1.66	31 74	29 00	496
498	Champion Fertilizer,	Lord & Polk Co., Odessa, Del.,	York,	"	7.09	3.68	2.59	0.84	1.94	26 74	26 00	498
499	Imperial Potash Manure,	P. S. Chappell & Son, Baltimore, Md.,	Dillsburg,	"	4.46	3.20	3.24	1.77	0.19	17 27	21 00	499
501	Diss. Raw Bone,	" " "	"	"	7.37	3.64	1.15	. .	2.59	28 15	31 00	501
504	Victor Bone Fertilizer,	N. J. Chemical Co., Philadelphia, Pa.,	Hamburg,	"	3.52	3.72	0.74	2.10	2.01	21 10	25 00	504
506	Kangaroo Complete Compound,	R. A. Wooldridge & Co., Baltimore, Md.	Dillsburg,	"	0.68	9.34	2.10	4.90	1.66	28 25	25 00	506
507	Fair and Square Phosphate,	" " "	"	"	1 84	4.14	5.07	3.33	2.94	26 96	27.00	507
508	Ammoniated Bone Phosphate,	J. Richmond, Philadelphia, Pa.	"	"	8.43	1.86	2.55	0.44	2.90	28 80	29 00	508
509	Cereal Bone Phosphate,	" " "	"	"	5.45	3.67	2.14	1.09	2.18	24 63	24 00	509
512	Arroo Guano,	New Jersey Chemical Co., Philadelphia, Pa.	Coatesville,	Sep. 6 '88	6.19	2.38	0.26	6.56	4.98	37 41	48 00	512
513	Standard Phosphate,	Lister Agricultural Chemical Works, Newark, N.J.	Chanceford,	"	11.42	1.63	0.51	4.49	4.77	42 00	32 00	513
514	Acidulated Fish Guano,	New Jersey Chemical Co., Philadelphia, Pa.,	Coatesville,	"	6.18	3.35	4.80	0.70	3.78	32 04	32 00	514
515	Twenty-three Dollar Phosphate,	M. L. Shoemaker Co., Philadelphia, Pa.,	Hamburg,	Sep. 8, '88	6.54	4.85	3.00	1.71	1.63	27 87	28 00	515
516	Buffalo Guano,	Milsom Rendering Co., Buffalo, N. Y.,	Hamburg,	"	4.51	2.14	3.71	1.28	3.22	25 76	28 00	516
517	Amn. Wheat and Corn Phosphate,	Crocker Fertilizing Co., Buffalo, N. Y.,	"	"	2.41	3.56	1.49	1.66	3.28	31 55	30 00	517
518	Good Enough Phosphate,	M. L. Shoemaker Co., Philadelpha, Pa.,	"	"	9.91	3.02	1.91	2.07	2.13	31 53	30 00	518
519	Ammoniated Bone Phosphate,	Crocker Fertilizer Co., Buffalo, N. Y.,	"	"	7.42	2.86	2.81	1.15	4.45	34 18	32 50	519
520	Buffalo Fertilizer,	Milsom Rendering Co., Buffalo, N. Y.,	Hamburg,	Sep. 15, '88	1.85	13.87	1.06	0.34	2.39	34 47	31 00	520
521	Twenty-five Dollar Phosphate,	Baugh & Sons' Company, Philadelphia, Pa.,	Dillsburg,	"	6.67	2.61	3.20	0.30	2.62	26 62	26 00	521
523	Echo Phosphate,	M. L. Shoemaker Co., Philadelphia, Pa.,	Hamburg,	"	7.11	3.20	2.94	1.60	1.68	26 16	25 00	523
524	Wheat Guano,	E. & A. Sharretts & Co., Baltimore, Md.,	Dillsburg,	"	5.62	3.30	2.49	1.41	2.53	26 27	34 00	524
525	Raw Bone Phosphate,	Baugh & Sons' Philadelphia, Pa.,	"	"	6.00	4.49	5.40	0.29	2.93	31 35	33 00	525
526	Bone Phosphate,	Susquehanna Fertilizer Co., Baltimore, Md.,	"	"	6.83	4.55	2.25	0.90	1.69	25 86	30 00	526
528	Western Reserve Fertilizer,	Jonathan Warner, Mineral Ridge, Ohio,	Franklin,	"	. . . .	. . .	0.31	0.56	. . .	0 87	18 00	528
531	Ammoniated Dissolved Bone,	N. W. Fertilizing Company, Chicago, Ill.,	Chambersburg,	Sep. 22, '88	2.93	3.25	4.35	0.46	3.62	34 14	33 00	531
533	Locust Point Compost,	G. Ober's Sons & Co. Baltimore, Md.,	Greencastle,	"	7.41	4.15	2.67	1.56	2.36	30 22	29 00	533
534	New Rival Phosphate,	Crocker Fertilizer Co., Buffalo, N. Y.,	"	"	8.15	2.58	1.76	1.53	1.94	26 71	28 50	534
535	Dissolved Bone,	Scott Fertilizer Company, Elkton, Md.,	Chambersburg,	"	4.24	13.19	3.04	. .	2.45	38 65	38 00	535
536	Prairie Phosphate	N. W. Fertilizing Company, Chicago, Ill.,	"	"	3.44	3.04	3.95	0.27	1.91	28 29	33 00	536
538	Forest City Phosphate,	Cleveland Dryer Company, Cleveland, Ohio,	Meadville,	"	4.20	6.75	3.10	0.30	2.54	28 90	30 00	538
539	Queen City Phosphate,	Crocker Fertilizer Co., Buffalo, N. Y.,	Greencastle,	"	5.42	5.32	1.16	1.41	2.35	27 51	29 00	539
541	Farmers' Standard Phosphate,	G. Ober's Sons & Co., Baltimore, Md.,	"	"	7.16	4.71	3.15	1.74	2.01	28 83	26 00	541

COMPLETE FERTILIZERS—Continued.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Potash.	Ammonia.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Number.
544	Azotized Phosphate,	Oakford & Small, York, Pa.,	Chambersburg,	Sep. 22, '88	3.82	4.04	1.81	1.07	1.61	$20 57	$27 00	544
546	Linden Phosphate,	Maryland Fertilizing Co., Baltimore, Md.,	Shippensburg,	Sep. 29, '88	7.09	4.28	1.29	1.75	. . .	20 66	20 00	546
547	No. 2 Phosphate,	F. Mehring, Bruceville, Md.,	"	"	6.47	2.13	4.86	0.66	1.82	24 50	29 00	547
548	Twenty-six Dollar Phosphate,	" " "	"	"	7.07	5.69	1.57	0.53	1.70	27 99	26 00	548
549	Homestead Fertilizer,	Michigan Carbon Works, Detroit, Mich.,	Sharon,	"	8.30	1.96	0.66	1.10	8.05	28 42	30 00	549
552	Exchange Guano,	Parks Guano Company, Baltimore, Md.,	Mechanicsburg,	"	6.19	2.88	1.53	2.29	2.24	25 64	28 00	552
553	No. 1 Bone Phosphate,	Sharpless & Carpenter, Philadelphia, Pa.,	Hummelstown,	"	4.68	3.06	3.06	2.16	1.99	23 76	26 00	553
556	Ammoniated Bone Phosphate,	Jacob Ulmer, Pottsville, Pa.,	Hamburg,	"	4.49	5.44	2.79	2.54	3.51	32 67	35 00	556
558	Jarves Drill Phosphate,	Michigan Carbon Works, Detroit, Mich.,	Greenville,	"	4.13	4.63	4.16	0.25	1.60	28 04	28 00	558
559	Soluble Ammoniated Phosphate,	Chesapeake Guano Company, Baltimore, Md.,	Franklin,	"	8.92	7.11	2.40	0.82	2.12	27 60	28 00	559
560	Success Phosphate,	Lister Agricultural Chemical Works, Newark, N.J.	Kittanning,	Oct. 6, '88	8.70	3.69	2.27	1.79	2.10	30 57	30 00	560
561	Knickerbocker Phosphate,	John Ralston, New York,	"	"	7.16	2.57	3.55	1.18	2.13	26 83	30 00	561
562	Honeybrook Phosphate,	E. J. Irwin, Waynesburg, Pa.,	Honeybrook,	Sep. 1, '88	7.62	3.56	4.94	2.44	1.87	30 64	30 00	562
563	Bone and Potash,	Symington Brothers & Co., Baltimore, Md.,	Apollo,	Oct. 6, '88	7.21	3.82	1.71	0.66	. . .	18 99	. . .	563
564	Normal Bone Phosphate,	L. P. Thomas & Son, Philadelphia, Pa.,	"	"	5.34	4.45	1.98	1.35	1.21	22 70	26 00	564
565	Garden City Phosphate,	N. W. Fertilizing Company, Chicago, Ill.,	"	"	5.11	3.54	5.57	0.40	2.46	27 06	33 00	565
568	Powhattan Wheat Fertilizer,	Lorentz & Rittler, Baltimore, Md.,	Saltsburg,	"	5.03	4.47	4.96	0.88	1.79	26 17	27 00	568
569	Diamond Crown Phosphate,	Peninsular Fertilizer Co., Smyrna, Del.,	West Chester,	"	5.28	3.33	2.01	2.49	2.16	25 22	28 00	569
570	Planet Phosphate,	Peninsular Fertilizer Co., Smyrna, Del.,	"	Oct. 13, '88	6.84	1.42	2.05	2.00	2.21	24 37	25 00	570
571	Blood Phosphate,	Wando Phosphate Co., Charleston, S. C.,	"	"	7.28	2.65	2.94	1.18	3.07	29 86	31 00	571
573	Champion Fertilizer,	Lord & Polk Company, Odessa, Del.,	"	"	6.36	3.18	1.90	1.74	1.95	25 16	26 00	573
577	Try Me Bone Phosphate,	J. Cope & Co., Lincoln University, Pa.,	Summit,	"	5.76	3.82	2.90	2.21	1.52	25 08	25 00	577
578	Ammoniated Bone Phosphate,	" " "	"	"	6.11	4.01	4.91	0.94	1.59	26 47	28 00	578
579	Raw Bone Phosphate,	" " "	"	"	4.25	6.38	2.80	3.33	2.51	31 11	34 00	579
581	Soluble Pacific Guano,	Glidden & Curtis, Boston, Mass.,	Concord,	"	6.88	5.15	1.84	2.29	3.88	36 20	34 00	581
582	King Philip Alkaline Guano,	Clark's Cove Guano Company, New York,	Chaddsford,	"	2.91	5.16	2.85	4.67	2.13	27 10	30 00	582
583	Defiance Complete Fertilizer,	" " "	"	"	0.71	7.34	3.90	2.64	1.61	24 11	25 00	583
584	Bay State Fertilizer,	" " "	"	"	9.59	2.36	1.81	2.26	3.40	34 39	40 00	584
589	Eureka Fertilizer,	Acme Fertilizer Co., Roaring Spring, Pa.,	Saltzburg,	Oct. 20, '88	. . . .	. . .	. . .	0.40	0.09	0 71	21 00	589
590	Nobesque Guano,	Glidden & Curtis, Boston, Mass.,	"	"	5.84	7.10	1.59	1.35	2.28	31 07	33 00	590
592	Lion Ammoniated Phosphate,	Keystone Fertilizer Co., Johnstown, Pa.,	Johnstown,	"	4.82	5.32	1.96	0.99	2.20	26 26	33 00	592
595	Cambria Phosphate,	" " "	"	"	3.54	4.75	2.53	0.17	0.30	17 06	28 00	595
596	Ammoniated Dissolved Bone,	N. W. Fertilizing Company, Chicago, Ill.,	"	"	3.33	6.48	6.54	0.07	2.73	30 20	35 00	596
597	Our Choice Phosphate,	Stutzman & Wilson, Johnstown, Pa.,	"	"	2.94	11.94	1.89	0.28	2.45	33 53	30 00	597
600	Eagle Phosphate,	W. Dibert & Co., Johnstown, Pa.,	"	"	2.51	5.65	2.46	3.97	1.34	23 56	25 00	600
601	Johnstown Fertilizer,	" " "	"	"	2.21	4.09	4.27	1.79	1.95	23 52	29 00	601

602	Bone Fertilizer,	Acme Fertilizer Co., Roaring Spring, Pa.,	Somerset,	"	....	2.57	5.11	0.29	1.19	12 54	28 00	602
605	Dissolved Bone Phosphate,	Somerset Fertilizer Co., Somerset, Pa.,	"	Oct. 27, '88	4.47	7.86	3.44	0.16	1.42	26 27	33 00	605
606	Ammoniated Raw Bone Phosphate,	J. Horner, Jr., & Co., Baltimore, Md.,	Uniontown,	"	2.39	6.85	2.99	2.31	2.32	27 37	32 00	606
609	Bone Phosphate,	Richey Bros., Uniontown, Pa.,	"	"	4.23	5.78	2.19	1.35	1.69	24 87	26 00	609
611	Farmers' Choice Phosphate,	I. P. Thomas & Son., Philadelphia, Pa.,	"	"	7.94	2.80	1.64	2.83	1.47	26 32	30 00	611
613	Tip Top Bone Phosphate,	" " " "	"	"	7.20	3.11	2.61	2.21	2.75	30 15	36 00	613
614	Ammoniated Phosphate,	Zell Guano Company, Baltimore, Md.,	Greensburg,	"	7.77	2.57	2.53	1.26	2.11	28 08	35 00	614
619	Americus Bone Phosphate,	Williams, Clark & Co., New York,	Curwensville,	"	8.30	4.09	0.48	2.49	3.50	36 59	38 00	619
621	Patent Phosphate,	Bradley Fertilizer Co., Boston, Mass.,	Biglersville,	"	7.65	3.90	1.75	0.72	2.94	29 95	30 00	621
624	Sound Phosphate,	American Fish Guano Co., Hoffman's Wharf, Va.,	"	"	1.02	11.11	1.74	1.22	1.81	28 17	23 00	624
625	Prolific Crop Producer,	Williams, Clark & Co., New York,	Easton,	Nov. 3, '88	5.28	3.06	1.20	1.18	1.96	22 09	....	625
626	Climax Phosphate,	Hubbard & Bro., Easton, Md.,	Biglersville,	"	5.81	5.45	2.39	1.31	1.59	25 85	28 00	626
627	Azotized Bone Phosphate,	J. Richmond, Philadelphia, Pa.,	Easton,	"	7.78	3.18	2.19	1.33	2.45	28 95	30 00	627
628	Complete Bone Manure,	Allentown Manufacturing Co., Allentown Pa.,	Allentown,	"	3.27	7.40	3.90	4.49	1.40	29 44	30 00	628
629	Soluble Bone and Phosphate,	" " "	"	"	4.94	3.75	2.88	4.01	...	19 06	24 00	629
630	Soluble Bone Phosphate,	J. Richmond, Philadelphia, Pa.,	Easton,	"	4.66	5.53	3.06	0.72	0.20	18 92	28 00	630
631	U. S. Phosphate,	Lister Agricultural Chemical Works, Newark, N.J.	Bethlehem,	"	5.48	5.19	1.30	2.12	2.44	28 43	30 00	631
632	Farmers' Favorite Phosphate,	Eureka Fertilizer Company, Perryville, Md.,	Montg'y Station,	Sep. 29, '88	5.61	3.37	4.26	1.13	2.21	26 42	....	632
634	Farmers' High Grade Phosphate,	Davison & Scarlet, Greencastle, Pa.,	Lebanon,	Oct. 6, '88	6.70	4.78	1.82	2.11	1.97	28 56	32 00	634
635	Wheat Special Phosphate,	Great Eastern Fertilizer Co., Rutland, Vt.,	Annville,	Nov. 3, '88	5.49	2.87	2.38	1.88	2.14	24 40	30 00	635
637	Economical Phosphate,	Lebanon Valley Phosphate Co., Annville, Pa.,	"	Oct. 6, '88	....	0.28	1.05	2.65	0.85	6 96	20 00	637
639	Harvest Queen Phosphate,	Lister Agricultural Chemical Works, Newark, N.J.	Embreeville,	Nov. 3, '88	5.58	5.85	2.57	1.43	2.27	29 50	28 00	639
612	No. 1 Bone phosphate,	J. R. Gawthop, Kennett Square, Pa.,	Kennett Square,	Nov. 10, '88	4.40	4.79	6.16	1.29	2.02	27 79	27 00	642
643	Cereal Bone Phosphate,	Oakford & Small, York, Pa.,	Toughkenamon,	"	4.56	4.48	1.63	0.82	1.53	21 70	24 00	643
649	Pioneer Bone Phosphate,	J. G. Downward, Coatesville, Pa.,	Kelton,	"	4.83	3.67	3.22	2.36	2.00	25 34	33 00	649
650	Pure Dissolved Bone,	Waring Manufacturing Co., Colora, Md.,	"	"	6.23	10.05	2.32	...	3.19	38 76	28 00	650
651	Q. & L. Phosphate,	" " "	"	"	6.90	5.00	3.04	2.08	2.67	32 68	25 00	651
652	Home Made Phosphate,	C. S. Kerns, Kelton, Pa.,	"	"	5.97	3.11	2.12	1.91	1.61	28 61	25 00	652
653	Dissolved Bone,	" " "	"	"	3.49	9.17	6.40	...	3.91	38 67	32 00	653
655	Raw Bone Phosphate,	Henry Cope & Co., Lincoln University, Pa.,	Elkview,	"	8.62	6.92	2.33	2.28	2.64	29 98	30 00	655
657	Ammoniated Bone Phospate,	" " "	Oxford,	"	6.99	3.33	2.11	1.08	1.66	24 92	25 00	657
660	Ammoniated Bone Phosphate,	Susquehanna Fertilizor Co., Baltimore, Md.,	"	Nov. 17. '88	6.99	5.02	2.57	0.48	1.75	27 71	24 00	660
663	Raw Bone Phosphate,	Pugh & Lyons, Oxford Pa.,	"	"	4.21	4.72	2.40	2.42	4.86	35 19	25 00	663
666	Ammoniated Wheat and Corn Phos.,	Crocker Fertilizer Company, Buffalo, N. Y.,	Meadville,	"	9.15	2.08	1.82	1.48	3.51	32 84	30 00	666
667	Pure Acidulated Bone,	Cincinnati Dessicating Co., Cincinnati, Ohio,	"	"	8.04	8.87	10.04	...	4.01	40 72	36 00	667
668	Dissolved Bone and Potash,	Bradley Fertilizer Company, Boston, Mass.,	Erie,	"	4.69	6.21	2.28	2.32	1.41	26 37	27 00	668
669	Ammoniated Bone Phosphate,	Crocker Fertilizer Company, Buffalo, N. Y.,	Meadville,	"	7.75	1.88	3.29	1.12	3.95	32 59	34 00	669
672	Keystone Bone Phosphate,	D. D. Hess & Son, Reading, Pa.,	West Chester,	"	8.52	5.73	2.64	0.40	0.14	24 74	25 00	672
674	Grade C. Phosphate,	Cumberland County Fert. Co., Carlisle, Pa.,	Mt. Holly Sp'gs,	Oct, 27, '88	5.98	4.47	1.91	1.85	3.40	31 66	31 00	674
675	Wheat-grower's Jewel,	Parks Guano Company, Baltimore, Md.,	Mifflintown,	Nov. 3, '88	7.54	1.69	4.02	2.31	1.60	25 74	25 00	675
677	Fair and Square Phosphate,	S. S. McDaniels, Elizabethtown, Pa.,	Elizabethtown,	"	0.86	4.84	1.43	0.48	1.37	14 60	....	677
678	Chesapeake Guano,	Chesapeake Guano Co., Baltimore, Md.,	Curwensville,	Nov. 13,'88	4.86	5.07	4.42	0.67	2.44	28 50	30 00	678
682	Hill & Drill Phosphate,	Bowker Fertilizer Company, Boston, Mass.,	Catawissa,	Nov. 14,'88	8.16	3.15	4.09	0.91	1.98	29 01	36 00	682
683	Fish and Potash,	Jos. Church & Co., Tiverton, Rhode Island,	Bloomsburg,	"	2.19	2.83	1.48	3.76	4.93	29 78	....	683
684	Bone Phosphate,	E. M. Weaver, Riverside, Pa.,	Boyd's Mills,	"	0.09	6.79	3.94	2.89	2.58	25 82	20 00	684
687	High-Grade Phosphate,	Jas. Thomas, Williamsport, Pa.,	Williamsport,	"	6.82	4.37	2.41	3.38	2.94	32 41	35 00	687
689	Diamond Soluble Bone,	Walton & Whann Co., Wilmington, Del.,	"	"	8.78	4.26	2.80	...	0.40	23 84	24 00	689
691	German (A.) Guano,	W. C. Newport & Co., Willow Grove, Pa.,	Willow Grove,	Nov. 17,'88	3.74	6.46	3.85	6.61	3.08	36 48	30 00	691
693	Rectified Phosphate,	" " " " "	" "	"	6.81	3.57	3.74	6.16	4.45	40 89	36 00	693
691	All Crop Fertilizer,	" " " " "	" "	"	7.81	3.97	2.89	1.51	3.00	32 47	25 00	694
695	Britton Bone Fertilizer,	N. J. Chemical Company, Philadelphia, Pa.,	Philadelphia,	Dec. 1, '88	6.45	4.67	1.52	2.68	2.35	29 68	35 00	695
696	W. & C. Phosphate,	" " " "	"	"	6.22	3.97	4.09	0.80	3.67	32 85	36 00	696
697	Acidulated Fish Guano,	N. J. Chemical Company, Philadelphia, Pa.,	"	"	6.81	3.08	4.89	0.86	3.60	31 95	36 00	697

COMPLETE FERTILIZERS—Continued.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Potash.	Ammonia.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Numberr
701	Phuine,	Fredk Phillips, Philadelphia, Pa.,	Philadelphia,	Dec. 1, '88	7.02	3.27	2.27	1.81	2.68	$29 20	$30 00	701
702	Farmers' Favorite Phosphate,	T. B. Simons, Andalusia, Pa.,	Glenside,	"	8.13	3.90	4.48	3.57	2.75	27 75	25 00	702
703	Potato Phosphate,	Williams, Clark & Co., New York,	Philadelphia,	"	6.72	1.53	0.35	7.45	3.84	32 29	40 00	703
704	Complete Manure for General use,	Mapes Formula Company, New York,	Glenside,	"	6.56	4.79	2.86	6.40	4.78	42 93	40 00	704
707	King Philip Guano,	Clark's Cove Guano Company, New York,	York,	"	2.96	5.08	3.81	4.05	2.29	27 75	28 00	707
708	Orchilla Guano,	R. A. Wooldridge & Co., Baltimore, Md.,	"	"	. . . .	5.93	10.98	0.17	0.19	19 04	21 00	708
709	Rising Sun Phosphate,	Lancaster Chemical Company, Lancaster, Pa.,	Lancaster,	Dec. 8, '88	3.07	9.17	3.49	2.61	2.87	35 14	31 00	709
710	Flag Brand Phosphate,	" " " "	"	"	6.30	4.39	1.36	1.51	2.48	28 13	25 00	710
711	Soluble Flour of Bone,	P. S. Chappell & Son, Baltimore, Md.,	York,	"	7.24	2.04	2.16	3.76	2.27	28 06	27 00	711
713	Ammoniated Phosphate,	F. Mehring, York Road, Md.,	Littlestown,	"	8.01	4.27	2.46	0.87	1.71	28 29	28 00	713
714	Bone and Potash,	C. H. Dempwolf & Co., York, Pa.,	York,	"	3.68	1.98	4.45	2.89	0.84	18 37	20 00	714
715	Dissolved Bone,	F. Mehring, York Road, Md.,	Hanover,	"	7.40	9.73	3.01	. . .	2.29	37 61	32 00	715
716	Ammoniated Bone Phosphate,	G. & D. Krug, Kingsdale, Pa.,	Littlestown,	"	4.61	4.34	1.46	1.65	2.09	24 24	25 00	716
717	York Ammoniated Phosphate,	A. R. Brodbeck, Hanover, Pa.,	Hanover,	"	5.64	2.90	5.10	2.14	1.55	25 15	28 00	717
718	Standard Phosphate,	H. S. Miller & Co., Newark, N. J.,	"	"	10.69	2.05	0.52	2.35	3.58	35 81	31 00	718
722	Dissolved Bone,	C. H. Dempwolf & Co., York, Pa.,	York,	"	4.80	6.91	6.07	. . .	3.95	37 08	36 00	722

Acidulated South Carolina Rock.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Available Phosphoric Acid *as found*.	Available Phosphoric Acid *as guaranteed*.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Number.
245	Dissolved S. C. Bone,	F. Phillips, Philadelphia, Pa.,	Philadelphia,	Mch. 20, '88	9.11	3.63	1.59	12.74	11—14	$21 06	$16 00	245
257	Acid Phosphate,	Sharpless & Carpenter, Philadelphia, Pa.,	"	Mch. 31, '88	10.45	4.23	3.49	14.68	13—14	24 89	16 00	257
264	Acid Phosphate,	M. L. Shoemaker Company, Philadelphia, Pa.,	"	Apr. 7, '88	9.89	4.64	0.49	14.53	12—14	23 45	18 00	264
265	Acid Phosphate,	J. E. Tygert & Co., Philadelphia, Pa.,	"	"	12.60	3.06	1.81	15.66	12—14	25 78	16 00	265
282	Dissolved S. C. Bone,	Dambmann Bros. & Co., Baltimore, Md.,	West Chester,	Apr. 13, '88	10.48	3.79	0.90	14.27	13—15	23 19	21 00	282
292	Acid Phosphate,	N. J. Chemical Co., Lincoln University, Pa.,	Johnstown,	"	10.78	5.06	0.51	15.84	13—15	25 51	25 00	292
301	S. C. Phosphate,	I. P. Thomas & Son, Philadelphia, Pa.,	Concord,	Apr. 18, '88	9.42	4.95	0.88	14.37	12—15	23 31	16 00	301
302	T. & P. Acid Phosphate,	Waring Fertilizer Company, Colora, Md.,	Summit,	"	10.94	4.41	3.71	15.35	13—15	26 11	15 00	302
317	Acid Phosphate,	J. Cope & Co., Lincoln University, Pa.,	Kennett Square,	Apr. 21, '88	9.61	4.69	3.40	14.30	12—15	24 21	15 50	317
320	Superior Rock Phosphate,	Susquehanna Fertilizer Company, Balto., Md.,	"	Apr. 28, '88	10.30	3.34	2.10	13.64	13—15	22 62	14 50	320
328	Acid Phosphate,	J. A. Cranston & Co., Newport, Del.,	Kelton,	"	12.19	3.11	0.79	15.30	12—14	24 80	14 50	328
336	Acid Phosphate,	Henry Cope & Co., Lincoln University, Pa.,	Oxford,	May 5, '88	10.77	5.01	3.28	15.78	13—15	26 56	14 00	336
340	Acid Phosphate,	Oakford & Small, York, Pa.,	"	Apr. 28, '88	10.75	5.57	1.02	16.32	13—15	26 52	15 00	340
360	S. C. Phosphate,	Cumberland County Fertilizer Co., Carlisle, Pa.,	Carlisle,	May 5, '88	9.26	4.21	1.14	13.47	13—16	22 01	20 00	360
361	T. & P. Acid Phosphate,	Waring Fertilizer Company, Colora, Md.,	London Grove,	Apr. 21, '88	9.63	5.03	3.71	14.66	13—15	24 94	15 00	361
379	Dissolved Bone Phosphate,	Pacific Guano Company, Boston, Mass.,	Erie,	May 19, '88	5.71	11.14	1.06	16.85	12—14	27 38	25 00	379
388	Dissolved Bone Phosphate,	Ramsburg Fertilizer Company, Baltimore, Md.,	Littlestown,	"	11.57	3.52	3.74	15.09	12—14	25 64	19 00	388
392	Acid Phosphate,	Popplein Silicated Phosphate Co., Balto., Md.,	York,	"	6.82	6.93	3.95	13.75	11—13	23 58	16 00	392
393	Dissolved S. C. Rock,	Slingluff & Co., Baltimore, Md.,	"	"	11.65	3.10	0.83	14.75	......	21 93	20 00	393
404	Dissolved Bone Phosphate,	Zell Guano Company, Baltimore, Md.,	"	May 26, '88	10.71	5.12	0.67	15.83	13—16	25 60	20 00	404
418	Dissolved S. C. Bone,	Lorentz & Rittler, Baltimore, Md.,	Hanover,	May 31, '88	11.27	3.37	2.91	14.64	12—15	24 58	18 00	418
420	Dissolved S. C. Bone,	Chemical Company of Canton, Baltimore, Md.,	"	"	9.54	4.34	4.11	13.88	13—17	23 85	18 00	420
421	Soluble Bone,	A. R. Brodbeck, Hanover, Pa.,	"	"	9.10	7.46	2.01	16.56	12—15	27 30	20 00	421
427	Dissolved Bone Phosphate,	Chesapeake Guano Company, Baltimore, Md.,	"	June 9, '88	6.65	7.05	3.01	13.70	14—16	23 12	18 00	427
439	Philadelphia Standard Phos.,	I. Yearsley, Coatesville, Pa.,	Coatesville,	June 14, '88	10.64	4.99	2.95	15.63	12—16	26 19	22 00	439
445	Dissolved S. C. Rock,	Peninsular Fertilizer Company, Smyrna, Del.,	Downingtown,	"	11.85	3.32	0.18	15.17	10—14	24 34	17 00	445
449	Acid Phosphate,	D. D. Hess & Son, Reading, Pa.,	Springfield,	"	7.11	5.22	2.13	12.33	12—15	20 58	25 00	449
459	Dissolved S. C. Rock,	J. A. Cranston & Co., Newport, Del.,	Oxford,	May 11, '88	11.56	3.83	0.81	15.39	12—14	24 94	14 50	459
462	Dissolved Bone,	Read & Co., New York,	Stillwater,	May 19, '88	8.75	4.78	4.00	13.53	12—14	23 25	28 00	462
465	Palmetto Acid Phosphate,	Bradley Fertilizer Company, Boston, Mass.,	Pottstown,	June 14, '88	11.40	3.55	0.56	14.95	12—14	24 26	25 00	465
491	Dissolved S. C. Bone,	Lorentz & Rittler, Baltimore, Md.,	Hanover,	Sep. 1, '88	10.85	2.70	5.18	13.55	12—15	23 73	18 00	491
492	Soluble Bone,	S. R. Brodbeck, Hanover, Pa.,	"	"	8.59	3.77	5.01	12.36	12—15	21 73	18 00	492
497	Diamond State Soluble Bone,	Lord & Polk Company, Odessa, Del.,	York,	"	11.64	4.53	1.07	16.17	14—16	26 20	20 00	497
503	Acidulated Phosphate,	New Jersey Chemical Co., Philadelphia, Pa.,	Hamburg,	"	6.73	6.65	1.00	13.38	13—15	21 81	20 00	503
505	Acid Phosphate,	J. Richmond, Philadelphia, Pa.,	Dillsburg,	"	11.07	3.83	1.70	14.90	12—15	24 62	18 00	505

Acidulated South Carolina Rock—Continued.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Soluble Phosphoric Acid.	Reverted Phosphoric Acid.	Insoluble Phosphoric Acid.	Available Phosphoric Acid *as found*.	Available Phosphoric Acid *as guaranteed*.	Comparative Commercial Value per ton.	Selling Price at Point of Selection.	Sample Number.
530	Superphosphate, ...	Broker Fertilizer Company, Boston, Mass., . .	Titusville, . . .	Sep. 22, '88	10.82	8.79	8.31	14.11	12—14	$23 90	$20 00	530
532	Soluble Bone, ...	Scott Fertilizer Company, Elkton, Md., ...	Chambersburg,	"	9.88	8.84	4.18	18.22	13—15	22 82	. . . .	532
537	Acid Phosphate, ...	Rasin Fertilizer Company, Baltimore, Md., . .	"	"	9.80	6.11	1.15	15.91	13—15	25 92	18 00	537
542	Dissolved S. C. Bone, ...	Chemical Company of Canton, Baltimore, Md.,	Greencastle, . .	"	9.36	5.82	0.91	15.18	14—16	24 67	17 50	542
543	Soluble Bone Phosphate, ...	F. Phillips, Philadelphia, Pa., ...	Chambersburg,	"	10.39	4.87	0.80	14.76	14—17	28 98	18 00	543
554	Soluble Bone Phosphate, ...	Hubbard & Bro., Easton, Md., ...	Hummelstown.	Sep. 29, '88	8.97	4.64	3.66	18.61	12—14	23 24	20 00	554
566	Acid Phosphate, ...	I. Yearsley, Jr., Coatesville, Pa., ...	Saltzburg, . . .	Oct. 6, '88	10.14	2.69	2.54	12.83	12—16	21 55	22 00	566
574	Dissolved S. C. Rock, ...	Lord & Polk Company, Odessa, Del., ...	West Chester, .	Oct. 13, '88	5.48	6.76	2.16	12.24	12—14	20 44	16 00	574
576	T. & P. Phosphate, ...	Waring Fertilizer Company, Colora, Md'. . . .	Summit, ...	"	9.62	5.53	8.78	15.15	14—16	25 78	15 50	576
586	Superior Rock Phosphate, . . .	Susquehanna Fertilizer Co., Baltimore, Md., .	Fairville, . . .	Oct. 20, '88	8.01	7.05	8.02	15.06	13—15	25 81	14 75	586
591	Dissolved Bone Phosphate, . . .	Glidden & Curtis, Boston, Mass., ...	Saltsburg, . . .	"	6.88	8.78	2.07	15.66	8—12	25 89	22 00	591
598	Dissolved Bone Phosphate, . . .	Zell Guano Company, Baltimore, Md., ...	Johnstown, . .	"	6.57	5.56	8.65	14.13	9—12	24 07	24 00	598
604	Acid Phosphate, ...	Somerset Fertilizer Co., Somerset, Pa., ...	Somerset, . . .	"	4.48	5.42	1.08	9.90	6—9	17 25	22 00	604
616	Imperial Phosphate, ...	I. W. Scott & Co., Pittsburgh, Pa., ...	Pittsburgh. . .	Oct. 27, '88	10.46	8.24	8.70	18.64	13—16	28 30	25 00	616
620	Dissolved S. C. Bone, ...	Bradley Fertilizer Company, Boston, Mass., . .	Curwensville, .	"	9.44	5.51	0.55	14.95	12—14	24 14	. . . .	620
623	Acid Phosphate, ...	Oakford & Small, York, Pa., ...	Biglersville, . .	"	7.42	5.80	2.05	13.22	12—15	21 97	18 00	623
636	Dissolved S. C. Bone, ...	Patapsco Guano Company, Baltimore, Md., . .	Annville, ...	Nov. 3, '88	8.81	7.13	1.71	15.94	13—17	26 18	21 00	636
640	Dissolved S. C. Bone Phosphate,	F. Phillips, Philadelphia, Pa.	Kennett Square,	Nov. 10, '88	8.28	3.52	1.25	11.80	11—14	19 88	. . . .	640
644	Bone Phosphate, ...	Zell Guano Company, Baltimore, Md., ...	Avondale, . . .	Oct. 6, '88	9.99	3.87	3.08	13.86	13—16	23 89	20 00	644
646	Dissolved S. C. Rock, ...	J. E. Tygert & Co. Philadelphia, Pa., ...	Toughkenemon,	Nov. 10, '88	9.87	3.06	1.55	12.93	12—14	21 31	14 50	646
654	Acid Phosphate, ...	Joseph Cope & Co., Lincoln University, Pa., .	Elkview, ...	"	10.98	4.26	2.62	15.24	12—15	25 43	15 00	654
656	Acid Rock, ...	Henry Cope & Co., Lincoln University, Pa., . .	"	"	8.49	7.57	8.10	15.06	13—15	26 94	15 00	656
671	Standard Phosphate, ...	L. C. & E. G. Emery, Coatesville, Pa., ...	Coatesville, . .	Nov. 17, '88	5.80	8.51	4.21	14.81	. . . . . .	24 58	22 00	671
676	Dissolved South Carolina Bone, .	Parks Guano Company, Baltimore, Md., ...	Mifflintown, . .	Nov. 3, '88	7.98	8.55	1.74	16.53	13—15	27 15	19 00	676
692	Acid Phosphate, ...	W. C. Newport & Co., Willow Grove, Pa., . . .	Willow Grove, .	Nov. 17, '88	11.74	4.51	0.46	16.25	14—16	26 98	18 00	692
705	Diamond State Soluble Bone, . .	Lord & Polk Co., Odessa, Del., ...	Williamsport, .	Dec. 1, '88	12.24	4.01	1.61	16.25	14—16	26 44	22 00	705
706	Dissolved S. C. Rock, ...	Lancaster Chemical Co., Lancaster, Pa., ...	York, ...	Dec. 8, '88	12.60	4.68	1.73	17.28	12—15	28 26	17 00	706

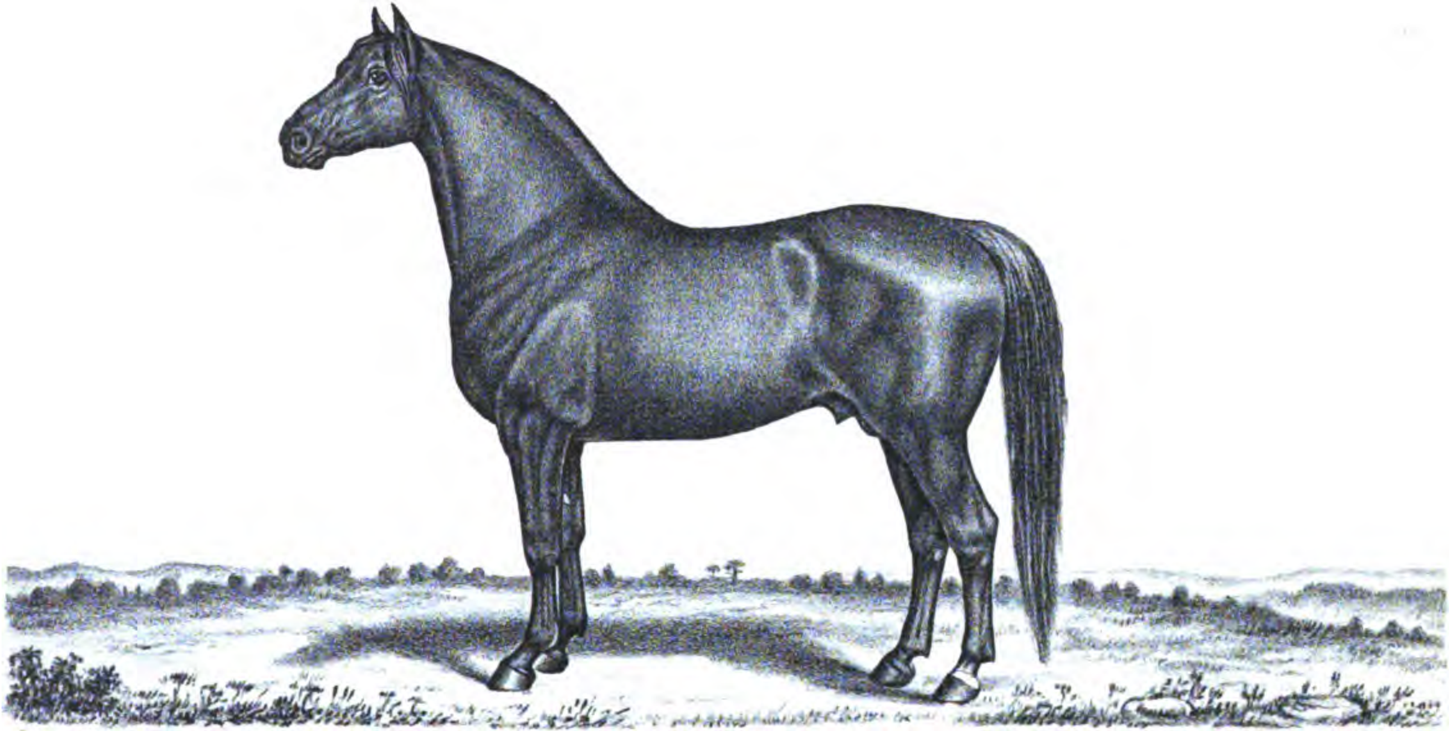
Ground Bone.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Phosphoric Acid.	Ammonia.	Comparative Commercial Value per ton.	Selling Price per ton at Point of Selection.	Sample Number.
246	Button Bone,	L. Moritz, Philadelphia, Pa.,	Philadelphia,	Mch. 20, '88	24.61	4.69	$41 47	$35 00	246
248	Ground Bone,	J. E. Tygert & Co., Philadelphia, Pa.,	"	Mch. 31, '88	22.31	4.60	38 94	32 00	248
251	Pure Bone Meal,	Sharpless & Carpenter, Philadelphia, Pa.,	"	"	21.72	4.39	36 65	33 00	251
267	Swift Sure Ground Bone,	M. L. Shoemaker Company, Philadelphia, Pa.,	"	Apr. 7, '88	22.95	6.42	44 78	34 00	267
268	Swift Sure Bone Meal,	" " "	"	"	21.88	7.71	48 09	34 00	268
272	Pure Bone Meal,	Baugh & Sons' Company, Philadelphia, Pa.,	"	"	22.77	4.57	38 31	34 00	272
273	Ground Bone,	J. Gawtharp & Co., Kennett Square, Pa.,	Avondale,	Apr. 14, '88	21.90	4.61	37 57	29 00	273
274	Ground Bone,	M. Berg, Philadelphia, Pa.,	Philadelphia,	"	25.51	4.68	41 25	35 00	274
286	Pure Bone Dust,	W. Diebert & Co., Johnstown, Pa.,	Johnstown,	"	21.36	4.51	36 69	36 00	286
291	Pure Bone Meal,	Keystone Fertilizer Company. Johnstown, Pa.,	"	"	22.00	4.47	37 20	35 00	291
298	Fine Ground Bone,	N. W. Fertilizing Company, Chicago, Ill.,	"	"	22.52	4.42	37 55	36 00	298
300	Pure Ground Bone,	J. Taylor & Co., Trenton, N. J.,	Summit,	Apr. 18, '88	29.35	2.61	38 22	31 00	300
305	Button Bone,	Emil Wahl, Philadelphia, Pa.,	"	"	26.04	4.78	42 29	33 00	305
314	Pure Ground Bone,	Crocker Fertilizer Company, Buffalo, N. Y.,	Pittsburgh,	Apr. 21, '88	24.13	4.97	40 03	33 00	314
316	Pure Bone Meal,	Walker, Stratman & Co., Pittsburgh, Pa.,	"	"	24.94	4.50	40 24	35 00	316
318	Ground Raw Bone,	J. A. Cranston & Co., Newport, Del.,	Kelton,	"	20.37	4.96	37 23	30 00	318
325	Fine Raw Bone,	Thompson & Edwards, Chicago, Ill.,	"	Apr. 28, '88	23.43	3.83	34 75	30 00	325
329	No. 8 Fine Bone,	Susquehanna Fertilizer Company, Baltimore, Md.,	"	"	20.16	4.35	34 95	29 00	329
333	Packing-House Bone,	" " "	Oxford,	May 5, '88	19.09	3.76	31 87	26 00	333
334	Knuckle Bone (fine),	" " "	"	"	23.74	5.49	42 41	30 00	334
337	Button Bone,	Josiah Cope & Co., Lincoln University, Pa.,	"	"	23.92	5.43	42 38	30 00	337
342	Steamed Bone,	Walker, Stratman & Co., Pittsburgh, Pa.,	Pittsburgh,	Apr. 28, '88	24.82	2.87	34 58	31 00	342
347	Bone Meal,	Shamrock Fertilizer Company, Mansfield Valley, Pa.,	Mansfield Valley	"	23.33	3.46	35 14	35 00	347
351	Raw Bone Meal,	Allegheny City Fertilizer Company, Allegheny, Pa.,	Allegheny City,	May 5, '88	20.75	5.24	38 57	35 00	351
352	Coarse Bone,	" " "	"	"	23.95	5.63	43 09	35 00	352
353	Azotized Bone,	" " "	"	"	12.92	7.70	39 12	35 00	353
357	Ground Bone No. 12,	Cumberland County Fertilizer Company, Carlisle, Pa.,	Carlisle,	"	20.54	5.04	37 68	34 00	357
362	Ground Bone,	Waring Fertilizer Company, Colora, Md.,	London Grove,	Apr. 28, '88	22.34	5.44	40 84	32 00	362
363	Superior Bone,	Cleveland Dryer Company, Cleveland, Ohio,	Beaver Falls,	May 12, '88	23.10	4.63	38 84	37 00	363
369	Pure Bone,	Schall Brothers, Erie, Pa.,	Erie,	"	24.31	4.25	38 76	34 00	369
371	Pure Bone Meal,	H. S. Miller & Co., Newark, N. J.,	"	"	24.00	4.39	38 93	31 00	371
374	Ground Bone,	Jarecki Chemical Company, Erie, Pa.,	"	"	19.82	5.10	36 66	32 00	374
383	Raw Bone Meal,	Cincinnati Desiccating Company, Cincinnati, Ohio,	Meadville,	May 19, '88	24.46	4.70	40 44	38 00	383
384	Bone Flour,	" " "	"	"	22.95	3.89	36 18	36 00	384
407	Bone Meal,	C. H. Dempwolf & Co., York, Pa.,	York,	May 26, '88	22.69	5.29	40 68	35 00	407
408	Ground Bone,	" "	"	"	21.26	5.10	38 60	32 00	408

Ground Bone—Continued.

Sample Number.	NAME OF FERTILIZER.	NAME AND ADDRESS OF MANUFACTURER.	Where Selected.	Date of Analyses.	Phosphoric Acid.	Ammonia.	Comparative Commercial Value per ton.	Selling Price per ton at Point of Selection.	Sample Number.
416	Pure Bone Meal,	Joseph Lister, Chicago, Ill.,	York,	May 31, '88	23.79	4.73	$39 87	$32 00	416
430	Button Bone,	Emil Wahl, Philadelphia, Pa.,	Avondale,	Apr. 30, '88	26.08	4.51	41 41	30 00	430
435	Pure Bone Meal,	J. Richmond, Philadelphia, Pa.,	Gettysburg,	June 9, '88	23.79	4.40	38 75	33 00	435
436	Pure Ground Bone,	Windle, Doan & Co., Coatesville, Pa.,	Mortonville,	"	22.23	5.10	39 57	35 00	436
457	Bone Meal,	J. A. Cranston & Co., Newport, Del.,	Oxford,	May 11, '88	19.96	4.21	34 27	30 00	457
472	Ground Bone,	Lister Agricultural Chemical Works, Newark, N. J.,	York,	June 9, '88	17.06	4.66	32 90	32 00	472
474	Pure Bone,	" " "	"	"	23.31	4.06	37 11	35 00	474
495	Pure Bone Meal,	H. S. Miller & Co., Newark, N. J.,	Hanover,	Sep. 1, '88	23.62	4.70	39 60	32 00	495
522	Cyclone Bone Meal,	Milson Rendering Company, Buffalo, N. Y.,	Hamburg,	Sep. 15, '88	25.92	4.18	40 13	33 00	522
557	Desiccated Bone,	Michigan Carbon Works, Detroit, Mich.,	Sharon,	Sep. 26, '88	23.66	3.13	39 30	36 00	557
567	Fine Raw Bone,	N. W. Fertilizing Company, Chicago, Ill.,	Saltsburg,	Oct. 6, '88	23.53	4.86	38 42	34 00	567
575	Ground Bone,	Peninsular Fertilizing Company, Smyrna, Del.,	West Chester,	Oct. 13, '88	18.60	4.08	32 67	30 00	575
580	Ground Bone,	Waring Fertilizer Company, Colora, Del.,	Concord,	"	22.08	4.90	33 74	31 00	580
583	Knuckle Bone,	Susquehanna Fertilizer Company, Baltimore, Md.,	Fairville,	Oct. 20, '88	24 05	5.40	42 41	30 00	583
587	Button Bone,	Sharpless & Carpenter, Philadelphia, Pa.,	Rosedale,	"	23.07	5.13	42 51	31 00	587
588	Pure Bone Meal,	" " " "	"	"	19.76	2 09	36 87	29 00	588
593	Fine Ground Bone,	Keystone Fertilizer Company, Johnstown, Pa.,	Johnstown,	"	20.90	4.60	36 51	33 00	593
591	Pure Bone Dust,	" " " "	"	"	22.95	4.66	38 79	35 00	591
599	Pure Bone Dust,	W. Dibert & Co., Johnstown, Pa.,	"	"	28.23	4.81	39 58	36 00	599
603	Bone Meal,	Somerset Fertilizer Company, Somerset, Pa.,	Somerset,	"	24.43	4.25	38 88	35 00	603
607	Slaughterhouse Bone,	Joshua Horner, Jr., & Co., Baltimore, Md.,	Uniontown,	Oct. 27, '88	23.28	6.06	43 83	35 00	607
608	Pure Ground Bone,	Richey Bros., Uniontown, Pa.,	"	"	21.58	4.21	38 87	30 00	608
610	Superior Bone,	Cleveland Dryer Company, Cleveland, Ohio,	"	"	20.62	5.23	38 40	36 00	610
612	Ground Bone,	I. P. Thomas & Son., Philadelphia, Pa.,	"	"	21.06	4.68	36 97	35 00	612
615	XX Raw Bone,	I. W. Scott & Co., Pittsburgh, Pa.,	Pittsburgh,	"	21.02	4.83	37 41	33 00	615
617	Pure Bone,	J. J. Pie, Osceola Mills, Pa.,	Curwensville,	"	20.93	4.66	36 77	....	617
638	Ground Bone,	Lord & Polk Chemical Company, Odessa, Del.,	Pocopsin,	Nov. 3, '88	22.41	3.31	35 40	32 00	638
641	Ground Bone,	J. R. Gawthrop & Co., Kennett Square, Pa.,	Kennett Square,	Nov. 10, '88	22.49	4.92	39 22	29 00	641
647	Ground Bone,	J. E. Tygert & Co., Philadelphia, Pa.,	Toughkenamon,	"	21 18	3.79	31 03	28 00	647
648	Ground Bone,	Crocker Fertilizer Company, Buffalo, N. Y.,	Westgrove,	"	22.71	5.19	40 39	32 00	648
658	No. 8 Ground Bone,	Susquehanna Fertilizer Company, Baltimore, Md.,	Oxford,	"	20.21	4.77	36 43	29 00	658
659	Packinghouse Bone,	Susquehanna Fertilizer Company, Baltimore, Md.,	Oxford,	"	21.81	3.34	36 20	21 00	659
661	Bone Meal,	J. Richmond, Philadelphia, Pa.,	Oxford,	Nov. 17, '88	23 81	4.58	39 41	28 00	661
662	Ground Bone,	Oakford & Small, York, Pa.,	"	"	22.72	4.87	37 68	30 00	662
664	Ground Bone,	Pugh & Lyons, Oxford, Pa.,	"	"	22.51	5.03	39 61	31 00	664
685	Ground Bone,	E. M. Weaver, Riverside, Pa.,	Boyd's Mills,	Nov. 24, '88	23.49	5.46	41 05	30 00	685

686	Ground Bone,	Farmer's Fertilizer Company, Syracuse, N. Y.,	Catawissa,	Nov. 24,'88	23.26	1.82	29 45	30 00	686
690	Pure Bone Dust,	W. C. Newport & Co., Willow Grove, Pa.,	Willow Grove,	Nov. 17,'88	22.85	4.76	30 08	33 00	690
698	Ground Bone,	Index Company (Limited), Philadelphia, Pa.,	Philadelphia,	Dec. 1,'88	23.93	3.56	36 02	35 00	698
699	Bone Meal,	" " " "	"	"	25.76	3.33	37 08	35 00	699
700	Button Bone Dust,	L. Moritz, Philadelphia, Pa.,	"	"	25.51	5.12	42 92	35 00	700
712	Pure Bone Meal,	Lancaster Chemical Company, Lancaster, Pa.,	Lancaster,	Dec. 8,'88	19.88	5.33	33 00	35 00	712
719	Ground Bone,	C. H. Dempwolf & Co., York, Pa.,	York,	"	22.49	5.33	40 61	32 00	719
720	Raw Bone Meal,	H. S. Miller & Co., Newark, N. J.,	Hanover,	"	23.84	4.72	39 89	32 00	720
721	Bone Meal,	C. H. Dempwolf & Co., York, Pa.,	York,	"	19.98	4.70	35 96	33 00	721



DELGARDO.

Imported French Coaching Stallion. First Prize Winner, Exhibition Pennsylvania State Fair, 1886. First Prize and Grand Prize, Exhibition Pennsylvania State Fair 1887 and Second Prize and Grand Prize, Exhibition Pennsylvania State Fair 1888, Owned by S. K. Nissley, Florin, Lancaster Co., Pa.

OFFICIAL DOCUMENT, No. 2.

MINUTES OF THE TRANSACTIONS

OF THE

PENNSYLVANIA STATE AGRICULTURAL SOCIETY,

1888.

OFFICERS OF THE SOCIETY FOR 1888.

PRESIDENT.

JOHN MCDOWELL, Washington, Pa.

VICE PRESIDENTS.

1st Vice-President, HENRY PALMER, Avondale, Pa.

1. GEORGE BLIGHT, Philadelphia.
2. WM. M. SINGERLY, Philadelphia.
3. J. A. PARSON, Philadelphia.
4. L. H. TWADDELL, Philadelphia.
5. W. H. SCOTT, Philadelphia.
6. DAVID H. BRANSON, Atglen, Chester county.
7. WILLIAM H. HOLSTEIN, Bridgeport, Montgomery county.
8. WM. TAYLOR, Womelsdorf, Berks county.
9. B. J. MCGRANN, Lancaster, Lancaster county.
10. DANIEL H. NEIMAN, Easton, Northampton county.
11. D. J. WALLER, Bloomsburg, Montour county.
12. IRA TRIPP, Scranton, Luzerne county.
13. HIRAM YOUNG, York, Pa.
14. GABRIEL HIESTER, Estherton, Dauphin county.
15. JOSEPH PIOLETT, Wysox, Bradford county.
16. L. A. MACKEY, Lock Haven, Pa.
17. JOHN A. LEMON, Hollidaysburg, Blair county.
18. JOHN S. MILLER, Huntingdon, Huntingdon county.
19. J. SCHALL WILHELM, York, York county.
20. R. J. C. WALKER, Williamsport, Pa.
21. GEORGE RHEY, Millwood, Westmoreland county.
22. W. W. SPEER, Pittsburgh, Pa.
23. JAS. F. MCKEAN, Pittsburgh, Pa.
24. JOHN MCDOWELL, Washington, Washington county.
25. J. D. KIRKPATRICK, North Liberty, Mercer county, Pa.
26. J. C. THORNTON, Fairview, Erie county.
27. WM. POWELL, Springboro', Crawford county, Pa.
28. JOEL A. HERR, Cedar Spring, Clinton county, Pa.

ADDITIONAL MEMBERS EXECUTIVE COMMITTEE.

By Election.

W. F. RUTHERFORD, Paxton, Dauphin county.
GEO. D. STITZEL, Reading, Pa.
JOHN H. ZIEGLER, Harrisburg, Dauphin county.
JEFFERSON SHANER, West Chester, Chester county.
HENRY PALMER, Avondale, Pa.

Ex-Presidents.

FREDERICK WATTS, Carlisle, Cumberland county.
DAVID TAGGART, Northumberland, Northumberland county.
JACOB S. HALDEMAN, Harrisburg, Dauphin county.

Ex-Officio.

D. W. SEILER, Harrisburg, Dauphin county, *Secretary.*
JOHN J. NISSLEY, Hummelstown, Dauphin county, *Treasurer.*
ALFRED L. KENNEDY, Philadelphia, *Chemist and Geologist.*
WILLIAM H, EGLE, Harrisburg, Dauphin county, *Librarian.*

LIFE MEMBERS.

Ackley, Thomas W., Philadelphia.
Adney, W. H. G., Washington.
Allen, John E., Harrisburg.
Allen, John F., Harrisburg.
Allen, Robert P., Williamsport.
Allen, Charles, Williamsport.
Allen, John H., Montourstown.
Allen, W. H., Agricultural College.
Alricks, William K., Harrisburg.
Andrews, D. S., Williamsport.
Andrews, E., Williamsport.
Andrews, James, Hogestown.
Anspach, J., Jr., Philadelphia.
Armstrong, James, Williamsport.
Armstrong, William H., Williamsport.
Armstrong, W. H., Easton.
Archer, W. L., Burgettstown.
Ashbridge, J. D., West Chester.
Ashbridge, E. B., Williston Inn.
Ayres, J. J., Williamsport.

Baker, J. B., Thorndale.
Baker, J. B., Jr., Thorndale.
Bailey, John T., Philadelphia.
Bailey, Charles L., Harrisburg.
Baldwin, W. A., Williamsport.
Banker, D., Franklin Forks.
Banker, J., Franklin Forks.
Barbour, J. B., Philadelphia.
Bard, Edwin Milford, Philadelphia.
Barto, Tobias, Reading.
Bates, Abram, Harrisburg.
Beaver, James A., Bellefonte.
Beard, Henry, Williamsport.
Beck, John B., Williamsport.
Bell, Samuel, Reading.
Bell, William, Mifflin.
Bennett, James, Pittsburgh.
Benson, G. S., Philadelphia.
Bender, George, Germantown.
Bercaw, Abraham, Easton.
Berkenbine, Samuel, Northumberland.
Berry, John J., Williamsport.
Bergner, C. H., Harrisburg.
Biddle, Charles M., Philadelphia.
Biddle, Craig, Philadelphia.
Biddle, Alexander, Philadelphia.
Billings, James B., Philadelphia.
Bittenbender, Stephen, Shamokin.
Boal, George, Boalsburg.
Bolden, George, Philadelphia.
Bomberger, Jacob C., Harrisburg.
Bound, David T., Kingston.
Bowman, Samuel, Wilkes-Barre.
Boyd, T. S., Easton.
Boyd, S. T., Easton.
Boyd, J. F., Chambersburg.
Boyer, W. W., Harrisburg.
Boyer, George W., West Fairview.
Buehler, Charles, Harrisburg.
Bush, L. L., Newtown.
Butt, Charles H., Williamsport.
Blair, Horace H., Williamsport.
Blight, George, Germantown.
Branson, D. H., Atglen.
Brown, George H., Philadelphia.
Brown, Jacob B., Columbia.
Brown, James V., Williamsport.
Brown, Jacob, Newberry.
Brown, G. W., M. D., Port Carbon.
Brown, James C., New Greenville.
Brown, ———, Titusville.
Brock, William Penn, Philadelphia.
Brautigam, Daniel, Northumberland.
Breeze, N. W., Wyoming.
Brady, George, Sharpsburg.
Bryson, Robert, Carlisle.

Calvin, Otis P., New York city.
Calder, James, Rev., Harrisburg.
Callahan, George, Philadelphia.
Cameron, Simon, Middletown.
Cameron, J. D., Harrisburg.
Campbell, Hugh, Philadelphia.
Campbell, James R., Philadelphia.
Campbell, Wm. S., Philadelphia.
Campbell, Thompson, San Francisco, Cal.
Campbell, John R., Williamsport.
Campbell, E. B., Jersey Shore.
Canfield, Ezra, Williamsport.
Capron, E. W., Williamsport.
Carter, Wm. N., Jersey Shore.
Carpenter, George, Jr., Germantown.
Carpenter, E. P., Pittsburgh.

Carlisle, Robert M., Philadelphia.
Cassell, Jacob, Harrisburg.
Cassett, A. J., Philadelphia.
Cassiday, Joseph A., Philadelphia.
Coburn, J. P., Aaronsburg.
Coder, N. B., Williamsport.
Coleman, Fletcher, Williamsport.
Colestock, Samuel J., Harrisburg.
Colton, Henry, Williamsport.
Comfort, J. C., Shiremanstown.
Comfort, E., Philadelphia.
Connelly, John, Hyde Park.
Cooper, E. M., Philadelphia.
Coover, John B., Mechanicsburg.
Coryell, John B., Williamsport.
Corson, George N., Norristown.
Curwen, John, Harrisburg.
Cummings, A. Boyd. Philadelphia.
Cummings, Charles, Harrisburg.
Cummings, R. D., Philadelphia.
Culver, W. B., Scranton.
Charles, J. S., Pittsburgh.
Chase, A. C., Syracuse, N. Y.
Chambers, Andrew, Philadelphia.
Chambers, Cyrus, Jr., Philadelphia.
Chess, Moses, Temperanceville.
Child, S. S., Harrisburg.
Chrisman, R. R., Harrisburg.
Christ, Ames H., Philadelphia.
Clark, Edward S., Philadelphia.
Clark, James, Williamsport.
Clark, James, Harrisburg.
Clay, M. L., Williamsport,
Clayton, William, Pine Grove.
Clopper, F. Y., Greensburg.
Cluly, William, Pittsburgh.
Cramer, Jacob, Uniontown.
Craig, Hugh, Philadelphia.
Craus, Samuel M , Williamsport.
Crawford, A. S., Williamsport.
Crawford, M. H., Philadelphia.
Crawford, Albert, Philadelphia.

Dallett, John, Philadelphia.
Darlington, H., Pittsburgh.
Dasher, David, Harrisburg.
Dateman, Robert, Milton.
Davis, Atlee G., Philadelphia.
Davis, A. B., Philadelphia.
Davis, E. W., Philadelphia.
Davis, William L., Easton.
Davis, John L., Newberry.
Davis, Joseph H., Pittsburgh.
Deal, Daniel, Philadelphia.
Deitz, George A., Chambersburg.
Deltry, H. F., Philadelphia.
Demming, H. C., Harrisburg.
Devereux, John, Philadelphia.
Devereux, James, Philadelphia.
Dewees, John, Shamokin.
Dempster, Robert, Phillipsburg, N. J.
DeHaven, Jehu, Harrisburg.
Dickey, Samuel, Oxford.
Dickey, E. V., Oxford.
Diehl, J. E., Beverly, N. J.
Dillingham, J. B., West Chester.
Ditman, Joseph G., Philadelphia.
Doyle, James B., Philadelphia.
Downing, Thomas H., Philadelphia.
DuBarry, J. N., Harrisburg.
Dull, J. J., Harrisburg.
Duncan, J. L., M. D., Pittsburgh.
Dunlap, H. E., Newberry.
Durar, Enoch, Philadelphia.
Dreer, William F., Philadelphia.
Dresbach, Daniel G., Beach Haven.

Early, Martin, Palmyra.
Early, D. S., Hummelstown.
Eberly, Christian, Eberly's Mills.
Eddy, George W., Philadelphia.
Edwards, Charles, Williamsport.
Egle, W. H., M. D., Harrisburg.
Euhbaum, William, Pittsburgh.
Eli, Richard E., Philadelphia.
Ellis, William, Philadelphia.
Eldred, Charles D., Williamsport.
Elder, Mathias, Williamsport.
Elliot, William G., Williamsport.
Elliott, B. A., Pittsburgh.
Elliott, W. R., Pittsburgh.
Elsof, D. B., Williamsport.
Embick, Frederick E., Williamsport.
Emminger, John, Hagerstown.
Engle, Charles K., Bustleton.
Ensworth, L. A., Williamsport.
Ensminger, J. T., Harrisburg.
Englebert, A. F., Wiconisco.
Eppes, W. J., Williamsport.
Estep, J. P., Pittsburgh.
Etter, B. F., Harrisburg.
Evans, David, Philadelphia.
Ever, Andrew, Muncy.
Eves, George S., Williamsport.
Eveland, S. D., Williamsport.
Evender, Thomas, Williamsport.
Everhart, J. T., Pittston.

Fager, George C., Harrisburgh.
Failes, George, Philadelphia.
Fairweather, William, McLean, Erie co.
Farnum, J, E., Philadelphia.
Farrell, John, Pittsburgh.
Farrell, John, Philadelphia.
Fass, George, Allegheny City.
Fertig, John, Titusville.
Felton, S. M., Philadelphia.
Fesler, Philip, Williamsport.
Filler, John H., Harrisburg.
Fiske, A. R., New York.
Fisler, J. E., Harrisburg.
Fisler, Amos, Harrisburg.
Fisher, John S., Williamsport.
Flenniken, J. C., Waynesburg.
Flemming, Robert, Williamsport.
Flickinger, Samuel, Harrisburg.
Ford, A. E., Philadelphia.
Foresman, Robert M., Williamsport.
Foresman, D. W., Williamsport.
Foresman, John, Williamsport.
Foresman, R. S., Williamsport.
Foresman, D. F., Slifer.
Foster, Frank E., Philadelphia.
Frantz, Jacob, Mount Hope.
Frisch, B., Harrisburg.
Fulton, Andrew, Pittsburgh.
Fuller, J. W., Montoursville.

Garber, Jacob B., Columbia.
Gardner, Jacob, Pittsburgh.
Garis, David, Easton.
Garman, Samuel, Williamsport.
Garman, John, Hyde Park.
Garrett, Walter E., Philadelphia.
Gaynor, Edward J., Easton.
Germyn, John, Rushdale.
Gillespie, James, Philadelphia.
Gilbert, Henry, Harrisburg.
Gilmore, Joseph, Williamsport.
Gibson, C. E., Williamsport.
Gibson, John, Williamsport.
Gibbs, J. W., M. D., Hyde Park.
Gillingham, Joseph E., Philadelphia.

Glatz, A. Hiestand, York.
Glenn, John McDonald, Pittsburgh.
Glenn, Robert A., Noblestown.
Goe, John S., Brownsville.
Goe, John S., Jr., Brownsville.
Gould, J. E., Philadelphia.
Gould, Stephen, Williamsport.
Gould, John, Luzerne.
Gould, Robert S., Williamsport.
Gould, Alex. S., Hickory Run.
Gobl, A., Harrisburg.
Goodwin, M., Philadelphia.
Gowen, F. B., Philadelphia.
Gregg, Theodore, Bellefonte.
Grigg, John Warner, Philadelphia.
Grier, James, Newberry.
Griest, Charles W., York Sulphur Springs.
Greenawalt, Alexander, Allegheny City.
Griffin, Henry, Scranton.
Grout, H. T., Philadelphia.
Gross, D. W., Harrisburg.
Grove, M. M., Harrisburg.

Hacket, John M., Easton.
Hacker, William, Philadelphia.
Haddock, D. J., Philadelphia.
Haehnlen, Frederick P., Harrisburg.
Haehnlen, William, Harrisburg.
Haehnlen, Jacob, Harrisburg.
Hageman, Augustus H., Williamsport.
Hagg, Philip, Williamsport.
Hain, George, Lower Paxton, Dauphin co.
Haldeman, Jacob S., New Market.
Hall, George B., Philadelphia.
Hall, John B., Williamsport.
Hall, John W., Harrisburg.
Halstead, N., Scranton.
Halstead, W. F., Scranton.
Hamilton, Hugh, Harrisburg.
Hamilton, A. Boyd, Harrisburg.
Hamilton, Hays, Huntingdon Furnace.
Hamilton, Cyrus E., Williamsport.
Hartman, John, Williamsport.
Hartman, Mathias, Catawissa.
Harrington, T. L., Williamsport.
Harvey, Chalkley, Chadd's Ford.
Hastings, H. S., Williamsport.
Hays, J. W., Williamsport.
Hazeltine, John, Philadelphia.
Herdic, Peter, Williamsport.
Hetrick, Josiah P., Easton.
Herdler, David, Williamsport.
Heaton, William, Jr., Philadelphia.
Heck, Lewis, M. D., Dauphin.
Hepburn, Andrew, Williamsport.
Hepburn, John, Williamsport.
Helick, Reuben, Easton.
Hemmingway, E. E., Easton.
Herr, Henry, Harrisburg.
Herr, D. S., Harrisburg.
Herriott, W. A., Oakdale, Allegheny co.
Hester, Joseph M., Easton.
Heylmun, E. G., Crescent.
Hickok, W. O., Harrisburg.
Hiester, A. O., Harrisburg.
Hicks, James, Pittson.
Hickman, Amos S., Monticello, Ill.
Higgins, William C., Williamsport.
Higgins, William V., Williamsport.
Hill, Theodore, Williamsport.
Hill, J. F. Scranton.
Hildrup, W. T., Harrisburg.
Hinkle, John R., Newberry.
Hinckley, Isaac, Philadelphia.
Hise, Adam, Williamsport.
Hitner, H. S., Barren Hill.
Hoffer, John, Harrisbuag.
Hoffman, H. W., Harrisburg.
Hoffman, Philip, Philadelphia.
Hoffman, H. B., Millersburg.
Hollenbach, George M., Wilkes-Barre.
Holliday, B. B., Wellsboro'.
Hollingsworth, Samuel S., Philadelphia.
Holstein, W. K., Bridgeport.
Holdin, H. L., Williamsport.
Hoopes, Thomas P., Philadelphia.
Hoopes, Clement R., Philadelphia.
Horstman, F. O., Philadelphia.
Horstic, John, Harrisburg.
Howell, A., Williamsport.
Howland, Ransford, Williamsport.
Honedry, Monsein, Renova.
Houston, H. H., Philadelphia.
Hudson, James E., Williamsport.
Hugus, P., Pittsburgh.
Hull, Joseph F., Hull's Mills.
Hull, W. R., Cogan Station.
Hummel, William, Harrisburg.
Hummel, S. A., Harrisburg.
Hunter, George W., Harrisburg.
Hutchinson, S. Pemberton, Philadelphia.
Hutter, William H., Harrisburg.
Hutchins, Thomas, Wyoming.
Huling, G., Williamsport.
Huyck, George, Newberry.
Hynicka, George A., Harrisburg.

Ingersoll, Harry, Philadelphia.
Innis, John, Easton.
Irwin, James, Philadelphia.

Jamison, Edward, Newberry.
Jamison, L., Williamsport.
Jamivier, Thos. G., Philadelphia.
Jarrett, John, Hepburn.
Jayne, Eben C., Philadelphia.
Jefford, A. H., Wyoming.
Jennison, E. P., Philadelphia.
Jenkins, G. S., Wyoming.
Jenkins, Steuben, Wyoming.
Jetter, Tuesley, Bethlehem.
Johnson, William, Easton.
Jones, Daniel, Exeter, Luzerne county.
Jones, John E., Williamsport.
Jones, Samuel, Williamsport.
Jones, B. F., Pittsburg.
Jones, W. H., Philadelphia.
Jordan, John, Philadelphia.
Jordan, Thomas J., Philadelphia.

Keely, Jerome, Philadelphia.
Keim, George DeB., Philadelphia.
Keller, John S., Orwigsburg.
Kennedy, A. L., M. D., Philadelphia.
Kennedy, Thomas B., Chambersburg.
Kendig, John, Philadelphia.
Kent, E. E., Syracus, New York.
Kepple, John, Harrisburg.
Ketterleinus, J. W., Philadelphia.
King, C. M., White Deer Mills, Centre county.
King, Alexander, Pittsburgh.
Kimball, Stephen, Philadelphia.
Kimball, J. M., Erie.
Kinny, L., Philadelphia.
Kinsman, William H., Easton.
Kinyon, S. C., Williamsport.
Kingsley, J. E., Philadelphia.
Kirby, William C., Harrisburg.
Kirkpatrick, John D., North Liberty, Mercer county.
Knapp, D. B., Williamsport.

Knight, W. H., Philadelphia.
Knight, Edward S., Philadelphia.
Knipe, Joseph F., Harrisburg.
Koller, H. M., Harrisburg.
Kramer, Philip, Philadelphia.
Kraybill, Jacob E., Marietta.
Kunkle, Benjamin S., Harrisburg.
Kuhn, William, Harrisburg.

Lamberton, Robert A., Harrisburg.
Landreth, Oliver.
Landreth, Leopold.
Landreth, Burnet, Jr.
Landreth, S. Phillips.
Languerrene, P. L., Philadelphia.
Lafrance, Isaac T., Wyoming.
Larvall, Edward, Easton.
Lee, Washington, Jr., Wilkes-Barre.
Leacock, J. N., Wyoming.
Leser, Frederick K., Philadelphia.
Lehman, M., Williamsport.
Lemon, John A., Hollidaysburg.
Lentz, George W., Williamsport.
Lerch, Frederick, Easton.
Levan, E., M. D., Williamsport.
Lindsey, Wm., Elizabeth, N. J.
Line, J. M., Allentown.
Lippincott, Edward, Williamsport.
Logan, Millard F., Williamsport.
Long, H. B., Pittsburgh.
Long, W. J., Osceola.
Longaker, A. B., Norristown.
Longstreth, John, Bristol.
Love, Samuel, Williamsport.
Lowe, Elias P., Williamsport.
Lukenbaugh, C. A., Bethlehem.
Lyon, Thomas, Williamsport.

Mackey, L. A., Lock Haven.
Mahaffey, William J., Newberry.
Mahaffey, Lindsey, Newberry.
Mahaffey, David, Cogan Station.
Magan, David, New Brighton.
Magee, George, Philadelphia.
Magee, James, Philadelphia.
Marshall, William, Bellefonte.
Martin, George H., Philadelphia.
Martin, Dewees J., Allentown.
Marchard, John, Pittsburg.
Mark, George M., Harrisburg.
Marvin, Selden, Erie.
Marcy, Ira, Wilkes-Barre.
Maxwell, Jacob S., Williamsport.
Mallor, Thomas, Philadelphia.
Mellon, Thomas, Philadelphia.
Meredith, James M., Calcium.
Merrick, George, Northumberland.
Metzgar, William, Harrisburg.
Messinger, Samuel, Easton.
Middleton, E. P., Philadelphia.
Middleton, Richard, Harrisburg.
Miller, Larr., Wayne, Clinton county.
Miller, J. G., Harrisburg.
Miller, John M., Hickory.
Miller, John S., Huntingdon.
Miles, James, Miles Grove.
Monday, S. S., Williamsport.
Montgomery, J. B., Williamsport.
Montgomery, James, Harrisburg.
Monaghan, R. E., West Chester.
Moore, Wesley, Newberry.
Moore, E. B., West Chester.
Moore, Andrew M., Philadelphia.
Moore, G. M., Philadelphia.
Morse, L. W., Ledgedale.
Morse, H. S., Williamsport.
Morris, D. B., Pittsburgh.
Morrison, S. G., Williamsport.
Motter, John, Harrisburg.
Mudge, Hiram, Williamsport.
Muhlenberg, H. H., Reading.
Mumma, David, Harrisburg.
Munday, H. F., Williamsport.
Mundell, John, Philadelphia.
Murdock, A. C., Pittsburgh.
Mutchler, John, Easton.
Meyers. B. F., Harrisburg.
Myers, Henry, Forty Fort.
Meyers, Charles E., Philadelphia.
McAllister, Archibald, Springfield Furnace.
McCaine, Daniel, Allegheny City.
McCaughey, J. A., Philadelphia.
McClure, A. K., Philadelphia.
McCrea, William H., Philadelphia.
McCormick, Robert, Montoursville.
McCully, Francis G., Philadelphia.
McDonald, Lewis, Harrisburg.
McDowell, John, Washington.
McFarland, John, Ligonier.
McFarland, George F., Harrisburg.
MacKellar, Thomas, Philadelphia.
McKean, Samuel M., Williamsport.
McKean, H. P., Philadelphia.
McKean, James S., Pittsburgh.
McLowell, Lewis, Williamsport.
McMinn, J. M., Williamsport.
McMickin, J. B., Williamsport.
McNish, A. L., Pittsburgh.
McPherson, Edward, Gettysburg.
McPherson, J. S., Wilkins.

Neilson, Robert, Philadelphia.
Neiman, D. H., Easton.
Newton, G. B., Springfield, Delaware county.
Nicely, George W., Newbury.
Nichols, James, Williamsport.
Nichols, W. F., Williamsport.
Nissley, John F., Hummelstown, Dauphin county.
Nissley, Joseph, Harrisburg.
Noble, John, Carlisle.
Noble, F. W., Easton.
Nutting, Lyman, Pine Grove, Schuylkill county.

Odenweider, H. L., Easton.
Olewine, Benjamin, Harrisburg.
Opp, George S., Maryland, Lycoming county.
Ott, Leander, Harrisburg.
Otsott, Jacob H., Harrisburg.

Page, A., Williamsport.
Palmer, Henry, Avondale.
Parsons, H. K., Harrisburg.
Parsons, Leroy, Harrisburg.
Parsons, H. C., Williamsport.
Parsons, George W., Harrisburg.
Parke, John E., Pittsburg.
Parker, Samuel J., Williamsport.
Patterson, Robert H., Pittsburgh.
Patterson, Lebanon Church, Allegheny county.
Patterson, John, Glenmore.
Pemberton, Clifford, Pittsburgh.
Pennock, Samuel, Kennett Square.
Pennock, Joseph, Harrisburg.
Perkins, H. J. Williamsport.
Perkins, James E., Lemar.
Perrott, W. S., Philadelphia.

ACT OF INCORPORATION AND BY-LAWS

OF THE

Pennsylvania State Agricultural Society.

AN ACT

To incorporate the Pennsylvania State Agricultural Society.

Incorporators. **Title.** **Corporate powers.** **Annual income.** **Disposal of same.**

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same,* That George W. Woodward, James Irvin, E. A. Thompson, Frederick Watts, T. J. Bingham and others, who have subscribed the constitution lately adopted by a convention assembled at Harrisburg, to improve the condition of agriculture, horticulture and the household arts, be and they are hereby created a body politic and corporate in law, by the name of "The Pennsylvania State Agricultural Society," and by that name shall have perpetual succession, and have capacity to sue and be sued, and may have a common seal, which at their pleasure may alter or renew; they may take by gift, grant, devise, bequest or otherwise, lands and tenements, goods and chattels, necessary for all the purposes for which the Society was instituted: *Provided*, The annual income therefrom shall not exceed ten thousand dollars, independent of annual contributions by members, and the same to convey, lay out, apply and dispose of, for the benefit of the said Society, as they under their charter and by-laws may direct.

By-laws.

SECTION 2. That the members of the said corporation shall have power to make and enforce such constitution and by-laws as may be necessary for the good government of the Society, and the same from time to time to revoke, alter and amend, as they may think proper: *Provided*, That the same shall not be inconsistent with the Constitution and laws of this State.

State appropriation.

SECTION 3. That the sum of two thousand dollars, out of any money in the treasury not otherwise appropriated, be and the same is hereby appropriated to the said Society; and annually hereafter a sum of equal amount to that paid by the members thereof into its treasury, affidavit of which fact, and the amount so raised by the treasurer of the Society, being first filed with the State Treasurer: *Provided*, Such sum shall not exceed two thousand dollars in any one year.

County Agricultural Societies.

Section 4. That when any number of individuals shall organize themselves into an agricultural or horticultural society, or any agricultural or horticultural society now organized within any of the counties of this Commonwealth, shall have adopted a constitution and by-laws for their government, elected their officers, and raised annually, by the voluntary contribution of its members, any sum of money, which shall have been actually paid into their treasury, for the purpose of being disbursed for the promotion of agricultural knowledge and improvement, and that fact be attested by the affidavit of their president and treasurer, filed with the commissioners of the county, the said county society shall be entitled to receive annually a like sum from the treasurer of their said county: *Provided*, That said annual payment out of the county funds shall not exceed one hundred dollars: *Provided further*, That but one such society in any county shall be entitled to receive such appropriation in any one year, under this act.

County appropriation.

Limitations.

Duty of President.

Section 5. That the President of the Pennsylvania State Agricultural Society, who shall receive or expend any of the moneys hereby appropriated, shall, annually, on the first Monday of January, transmit to the Governor of the Commonwealth a detailed account of the expenditure of all the moneys which shall come into his hands under this act, and stating to whom and for what purpose paid; and a copy of the said report shall be transmitted to the Legislature at as early a day as practicable, and the original shall be filed in the office of the Secretary of the Commonwealth. And the presidents of the several county agricultural societies shall annually transmit, in the month of December, to the Executive Committee of the Pennsylvania State Agricultural Society, all such reports or returns as they are required to demand and receive from applicants for premiums, together with an abstract of their proceedings during the year. This act shall at all times be within the power of the Legislature to modify, alter or repeal the same.

Duty of Presidents of County Agricultural Societies.

John Cessna,
Speaker of the House of Representatives.
Benjamin Matthias,
Speaker of the Senate.

Approved—The twenty-ninth day of March, Anno Domini one thousand eight hundred and fifty-one.

Wm. F. Johnston.

CONSTITUTION AND BY-LAWS

OF THE

Pennsylvania State Agricultural Society.

Title. Objects.

The name of the Society shall be the PENNSYLVANIA STATE AGRICULTURAL SOCIETY. The objects of this Society are to foster and improve agriculture, horticulture, and the domestic and household arts.

Who are Members.

Members.

SECTION 1. The Society shall consist of all such persons as shall pay to the Treasurer not less than two dollars, and annually, thereafter, not less than two dollars; and also, of honorary and corresponding members, the names of the members to be recorded by the Secretary.

The officers of county agricultural societies in this State, or delegations therefrom, shall be members *ex-officio* of this Society.

Life Members.

The payment of fifty dollars shall constitute life membership, and exempt the members so contributing from all annual payments.

Officers.

Officers.

When elected.

SECTION 2. The officers of this Society shall be a President, Vice President from each congressional district, three-fourths of whom shall be practical agriculturists or horticulturists, a Treasurer, a Corresponding Secretary, a Recording Secretary, a Librarian, an Agricultural Chemist and Geologist, and such assistants as the Society may find essential to the transaction of its business; an Executive Committee, consisting of the above-named officers, five additional members, with the ex-Presidents of the Society, all of whom shall be elected at the annual meeting in January by the qualified members of the Society.

Of the President.

President's duties.

SECTION 3. The President shall have a general superintendence of all the affairs of the Society.

First Vice President.

Election of and duties of First Vice President.

That at the annual election of this Society there shall be elected from one of the number of Vice Presidents one of said officers to act as First Vice President, whose duty it shall be to act as President in case of absence or the death of the President.

Ex-Presidents.

Ex-Presidents.

That whenever the number of ex-Presidents exceeds five (5), the name receiving the lowest number of votes shall be the one dropped from the list of officers.

Of the Vice Presidents.

Duties of Vice Presidents.

It shall be the duty of the Vice Presidents to take charge of the affairs of the association in their several districts; to advance all its objects; to call upon farmers to report as to the condition of agriculture in their neighborhood; to ask for information as to the modes of cultivation adopted by different farmers; and, as far as in their power, to make known the resources of their districts, the nature of its soil, its geological character, and all such matter as may interest farmers in every part of the State.

Treasurer.

Duties of Treasurer

The Treasurer shall keep an account of all moneys paid into his hand, and shall pay bills when audited and approved by the Executive Committee. Each order for payment must be signed by the President or chairman of the Executive Committee.

Corresponding Secretary.

Duties of Corresponding Secretary

The duty of this officer shall be to invite a correspondence with all persons interested in agriculture, whether in the State of Pennsylvania or elsewhere, but especially with our consuls in foreign countries, that new seeds, vegetables, or live stock may be introduced, and their fitness for cultivation and propagation in our climate be tested. At each stated meeting of the Society, he shall read his correspondence, which shall, either the whole, or such parts as may be selected by the Society, form a portion of the transactions. He shall also correspond with the President or other officers of each State society in the United States, at least twice in the year, for the purposes of combined and mutual action, and to be informed of the results and progress of each other's efforts; also, to invite mechanics to forward models or implements for examination or trial.

Recording Secretary.

Duties of Recording Secretary.

The Recording Secretary shall keep the minutes of the Society and of the Executive Committee. At the close of each year he shall prepare for publication such parts of the minutes and transactions of the Society as may be designated.

Powers of Recording Secretary.

The Recording Secretary shall have power to approve of such bills and contracts as he is authorized to make and the Treasurer shall pay the same.

Librarian.

Duties of Librarian

The Librarian shall take charge of all books, pamphlets, etc., belonging to the Society, and shall act as curator to preserve seeds, implements, or whatever property the Society may possess.

Vacancies—how filled.

In case of the death of any of the officers of this Society the the President shall have power to fill the vacancy by appointment until the next annual meeting of the Society.

Executive Committee and Quorum.

Duties of Executive Committee.

The Executive Committee shall transact the business of the Society generally; shall superintend and direct the publication of such of the reports and transactions as they may deem proper, and shall designate the time and places for annual exhibitions, regulate the expenditures, examine all accounts, and keep such general charge of the affairs of the Society as may best promote its interests.

Quorum of Executive Committee.

They shall select their own chairman, and meet quarterly, and at any other time when convened by the President; five members shall form a quorum.

Special meeting of Society.

They shall call special meetings of the Society when necessary.

Annual Meeting of the Society and Quorum.

Annual meeting of Society—when held.

Mode of electing Officers.

General and special Meetings.

SECTION 4. The Society shall meet annually, on the third Wednesday of January, at Harrisburg, when all the officers of the Society, not otherwise appointed, shall be elected by ballot for the ensuing year, and until another election. The polls shall be opened at 10 A. M., and close at 12 o'clock M., when the result of the election shall be announced. They shall also hold a general meeting at the time of the annual exhibitions, and special meetings whenever convoked by the Executive Committee.

Quorum of Society.

Fifteen members shall form a quorum for the transaction of business, but no member in arrears shall be entitled to the privileges of the Society.

Qualifications of Voters.

Qualifications of voters.

SECTION 5. No annual member hereafter shall be entitled to vote for the election of officers of the Pennsylvania State Agricultural Society unless he shall have been a member of the previous State fair, and in default of a State fair, then three months' previous membership shall be necessary.

Eligibility.

SECTION 6. No one shall be eligible to office hereafter who has not obtained a right to vote under section five.

Alterations.

Alterations and amendments. Vote necessary to.

SECTION 7. This constitution may be altered or amended at the annual meetings in January, by a vote of two-thirds of the members in attendance.

Must be submitted to Executive Committee.

All amendments to the constitution, to be voted upon at the annual meeting of the Society in January, must be submitted to the meeting of the Executive Committee in September preceding said annual meeting.

TRANSACTIONS OF THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY, 1888.

Harrisburg, Pa., *January 17, 1888—7 o'clock p. m*,

The meeting of the Executive Committee was called to order by Secretary Seiler.

Owing to the death of President Wilhelm, on motion, John McDowell, of Washington county, was made chairman of the meeting.

The following members of the Executive Committee were present: Messrs. Branson, Speer, Taylor, Tripp, McDowell, Mackey, Rutherford, Nissley, Ziegler, Hiester, Blight, Demming and Seiler.

Letters from Messrs. Kennedy and Holstein were read regretting their inability to be present on account of business, in case of the former, and sickness. Also telegram from Mr. Shaner of West Chester announcing the fact that sickness in his family detained him from being present. A letter from Dr. J. A. Paxton was read informing the committee that if his critical condition would allow, he would be present on Wednesday.

The minutes of the last meeting were read, and on motion approved.

On motion of Mr. Seiler it was resolved that the presiding officer should appoint a committee of three to prepare and present to this committee suitable resolutions on the death of President Wilhelm, Vice President Tobias Barto and John S. Keller.

The report of the Treasurer in detail was then read, which on motion was adopted and ordered to be incorporated in the Society's proceedings.

The report of the Committee on Experimental Seed Planting was then called for. Mr. Branson reported the financial embarrasment of the Society prevented the carrying out of the experimenta to the extent of former years. In his opinion the seed tests should be continued as the results are most satisfactory and this Society received much credit therefor. The system of making the experiments in different localities of the State in his judgment was better than making an experiment in any one section of the State.

Mr. McDowell. The success in experimenting in this direction has in his judgment been most beneficial. The first year's efforts were crowned with success. The introduction of the different varieties of wheat increased the crops and the ratio thereof. The extreme dry weather of this year was most disastrous and the result not favorable.

On motion adjourned to meet at 10 o'clock to-morrow morning.

SOCIETY MEETING.

ROOMS OF THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY,
WEST CORNER THIRD AND MARKET STREETS,
HARRISBURG, PA., Wednesday, *January 18, 1888.*

The members of the Pennsylvania State Agricultural Society met in annual session at the rooms of the Society, and at 10 o'clock A. M. the meeting was called to order by Secretary Seiler.

On motion, Mr. David H. Branson was called to the chair.

Mr. Seiler moved that the chairman of the meeting appoint a committee of three to conduct the election of officers for the ensuing year. The motion was seconded by Mr. Dull, and unanimously agreed to.

Messrs. W. F. Rutherford, J. S. Wilhelm and William Taylor were appointed the committee.

On motion, the chairman of the meeting was requested to appoint a committee to audit the accounts of the treasurer, whereupon he appointed for that purpose Messrs. Gabriel Hiester, J. R. Piper and W. W. Speer.

The balloting for officers having been proceeded with and concluded, during a recess taken for that purpose,

Mr. J. Schall Wilhelm presented the report of the judge and tellers of election, showing the election of the following officers:

President.

John McDowell,	67 votes.

First Vice-President.

Henry Palmer,	67 votes.

Vice-President.

1. George Blight,	67 votes.
2. Wm. Singerly,	67 "
3. J. A. Paxson,	67 "
4. L. H. Twaddell,	67 "
5. W. H. Scott,	67 "
6. David H. Branson,	67 "
7. William H. Holstein,	67 "
8. Wm. Taylor,	67 "
9. B. J. McGrann,	67 "
10. Daniel H. Neiman,	67 "
11. D. J. Waller,	67 "
12. Ira Tripp,	67 "
13. Hiram Young,	67 "
14. Gabriel Heister,	67 "
15. Joseph Piollet,	67 "
16. L. A. Mackey,	67 "
17. John A. Lemon,	67 "

18. John S. Miller,	67 votes.
19. J. Schall Wilhelm,	67 "
20. R. J. C. Walker,	67 "
21. George Rhey,	67 "
22. W. W. Speer,	67 "
23. Jos. S. McKean,	67 "
24. John McDowell,	67 "
25. J. D. Kirkpatrick,	67 "
26. J. C. Thornton,	67 "
27. Wm. Powell,	67 "
28. Joel A. Herr,	67 "

Additional Members—Executive Committee.

W. F. Rutherford,	67 votes.
Geo. D. Stetzel,	67 "
John H. Ziegler,	67 "
Jefferson Shaner,	66 "
Henry Palmer,	67 "

Ex-Presidents, Member of the Board.

Frederick Watts,	67 votes.
D. Taggart,	67 "
Jacob S. Haldeman,	67 "

Corresponding and Recording Secretary.

D. W. Seiler,	67 votes.

Treasurer.

John J. Nissley,	67 votes.

Chemist and Geologist.

A. L. Kennedy,	67 votes.

Librarian.

Wm. H. Egle,	67 votes.

We, the undersigned judge and tellers, appointed to conduct the election of officers, of the Pennsylvania State Agricultural Society for the year 1888, have performed the duties, and certify the above vote to be correct.

W. F. Rutherford, *Judge.*
Wm. Taylor,
J. Schall Wilhelm. } *Tellers.*

Mr. D. W. Seiler moved that a committee of two be appointed to escort the newly elected president to the chair. Agreed to. The chair appointed Mr. D. W. Seiler and Mr. J. Schall Wilhelm.

The Chairman. Gentlemen, I have the honor of introducing to you John McDowell, of Washington county, who has been elected president of the association for the ensuing year A greater honor could not have been conferred upon him had he been elected President of the United States.

Mr. McDowell. Gentlemen, I am grateful to you, and I cannot too highly appreciate the honor you have conferred upon me in making me president of the Pennsylvania Agricultural Society. The responsibility is great, and I almost confess that it is with some fears that I accept the trust you have so generously confided to my care. As your presiding officer I can only succeed with your cordial coöperation in the discharge of the duties devolving upon me. I trust this is not asking too much. What I earnestly desire is harmony and good feeling among all the officers and members. Let our plans be well matured, and let them be such as will commend themselves, not only to the Society but to the public. It becomes us to keep pace, or rather, to keep ahead of all other similar State organizations. We must, by correspondence, intercourse, and exchange of publications and by other means, maintain and advance our standing as an organization true to its charter. Its object, the advancement of agriculture in every feature, is a laudable one. It must not only encourage the products of the soil, but sell the implements of husbandry. It is at our fairs that we demonstrate to the public what good we are doing. I say, to my personal knowledge, that there is no society of a similar kind in the United States which has made a record such as this society has made. To speak of it in detail would take up too much time. It is to this society that the farmer of Japan comes to buy our Devon cattle. It is to this society that the farmer of Egypt and India comes to buy our plows and reapers; and it is to this society that the farmer of the Argentine Republic comes to buy our Merino sheep, the result of the National Sheep Show, held in Philadelphia, under the auspices of this society, in 1880. By such laudable undertakings the society has made for itself a record, such as no other State organization has made or can make.

Gentlemen, for these reasons I am proud of it. Shall this work cease? Is there not much to be done? What can we do, think or devise? That is our work. I hope there shall be harmony and good feeling among the members in the board, in the State and everywhere. Wherever we are known and represented let us spread our influence and work, and practical good will grow out of it.

Thanking you, again, for the honor you have conferred upon me, I shall endeavor to discharge the duties to the best of my ability, with fidelity and impartiality.

Mr. MACKEY. Mr. President, It may be in order to make a suggestion at this stage of the meeting. I notice by the return of the judges that John McDowell has been elected president, and also a vice president. While I appreciate and congratulate the society in having procured the services of the gentleman, who is as capable of discharging the duties as any man in this Commonwealth or elsewhere, not excepting Grover Cleveland, while I recognize his ability, I believe it would be to the interest of the society if a vice president should be elected in his place from his district. I therefore suggest that he tender his resignation as vice president; that he suggest some person from his district to take his place, and that the board fill the vacancy.

Mr. McDOWELL. I will do so with pleasure. I would like a little time to confer with the person whom I have in view. I will say plainly that it is Mr. John M. Miller of our place, who has been an exhibitor at our fairs of very fine blooded stock; but, owing to the illness of his wife, the circumstances may be such that he cannot take the place. If I am allowed the privilege, I would defer his appointment until after I have conferred with him. I will, however, tender my resignation as vice president.

Mr. MACKEY. I move that the resignation be accepted, and that Mr. McDowell be permitted to appoint a substitute.

It was agreed to.

Mr. David H. Branson offered the following resolution:

In order that the various interests representing the agriculture of Pennsylvania, it is proposed for their mutual instruction, that a State convention or institute be called by the Pennsylvania State Agriculture Society, the fruit growers, dairymen's association, and all kindred organizations, under the auspices of the Pennsylvania State Board of Agriculture; it is, therefore,

Resolved, That a committee be appointed by this society to confer with the Secretary of the Pennsylvania State Board of Agriculture, and with the several organizations named, with a view of perfecting and making all the preliminary arrangements as to dates and place of meeting.

Mr. BRANSON. You all can readily see that we have various agricultural interests in Pennsylvania. Whilst we have had institutes and agricultural fairs, by the county and State, we have never had an institute or convention of this kind. Inasmuch as the Legislature has made an appropriation to conduct these county institutes, under the auspices of the State Board of Agriculture, we had thought that in order to have a union and bring together the different views and the various subjects that are agitating the people to-day, an institute of this kind would be not only interesting and instructive to all parties concerned, but being under the auspices of the State Board of Agriculture, it would not entail any expense on the representatives. It would be something we would all appreciate and be benefited by. If there is any opposition to it we would be glad to hear it now.

Mr. MACKEY. How can we get the expense paid by the State Board of Agriculture, if this society authorizes the institute?

Mr. BRANSON. I might say that this society is composed of very many intelligent people, and every one who is put on the programme—it will take us all nearly to fill the programme—will have his expense paid by the State Board. This is money appropriated by the State for that purpose. Those who have duties to perform in the meeting will have their expenses paid. I had a conversation with the Secretary yesterday, and he so signified.

Mr. McDOWELL, President. Before we put the resolution, I will say that I am a member of the State Board of Agriculture, and my expenses are met by the State. There are several other members of the board who are also members of this society. The rules are to pay the expenses of all who are essayists or debaters. There is no reason why every member should not participate in the discussions, as there are no restrictions. I believe practical good will result from this, from the fact that it brings about a harmony of feeling in the different bodies of our State. You can hardly imagine a subject that will not come up in one of these institutes. The time when this institute will be held can be fixed later. I presume it may be held sometime in October.

It was resolved, on motion of Mr. Mackey, that this resolution be referred to the incoming executive committee, with a recommendation for its adoption.

Mr. ACKLEY. Mr President, I desire to offer the following resolution:

The resolution was read by the secretary, as follows:

WHEREAS, The grounds of this society so eligibly situated, accessible by both steam and street railways, should not be allowed to remain idle fifty weeks out of the fifty-two weeks of the year:

Resolved, That it is the opinion of the members of the Pennsylsylvania State Agricultural Society that the incoming officers or managers should exercise immediate measures, as in their judgment may seem proper and advisable, for the rental of the grounds, when not in use by the society, that an income may be derived therefrom. They are hereby instructed and authorized to make all necessary contracts or agreements for the carrying out of this resolution.

Mr. MAGEE. Who would have the renting of the grounds under that resolution?

Mr. SEILER. The Committee of Arrangements.

The resolution was adopted.

Mr. WILHELM. Mr. President, I offer the following resolution.

The resolution was read by the clerk, as follows:

"*Resolved*, That the president be authorized to appoint a Committee of Arrangements, to consist of eleven members, including the president, secretary and treasurer, who shall have the same powers as the same committee has had for the past two years."

The resolution was agreeed to.

Mr. SEILER. At the last meeting of the Executive Committee, there was a committee appointed to prepare resolutions on the deaths of Messrs. McConkey, Wilhelm, Capp and Barto.

Mr. BRANSON. That committee is not yet ready to make report.

Mr. SEILER. Mr. President, I move that when that commitee reports the secretary be instructed to have the report published and a copy sent to the family of each deceased member referred to.

The motion was agreed to.

Mr. BLIGHT. Mr. President, I think we ought to proceed to the selection of a date for the holding of the next exhibition. I therefore move that the exhibition open on Monday, September 3, and close on Saturday, September 15.

Mr. SEILER. I second the motion.

Mr. MACKEY. I think that was the time fixed last year, was it not?

Mr. SEILER. Yes sir, but this being a new board, the selection ought to be confirmed.

The motion was agreed to.

Mr. BRANSON. There does not seem to be anything before the meeting, so I will announce that to-morrow and the next day we propose holding, in Atglen, about fifty miles from here, a county institute. It will be a two-day meeting with evening lectures, free for everybody. We should be very glad to see any or all of you there. There will be some of the best talent in the county present.

The PRESIDENT. I would like to supplement my preliminary remarks with an urgent appeal to every member to take a deep interest in the Agricultural Society of Pennsylvania. We can make it a grand success if we will all work, and work in harmony. Do not be backward about communicating with any of the officers. Do not be backward about corresponding with any of the other State organizations and gathering any information that will give us light. It is a grand and honorable enterprise that we are all associated in, and when we need legislation, every man should come to the wheel.

I hope we will all receive copies of the report of the International

Sheep Exhibition held in 1880. Mr. Coleman should, if in his power at all, furnish us with at least one hundred copies. You can obtain them from your members of Congress, although they are entitled to but three each, when they ought to receive thirty each, or more. This book has been solicited in Germany, England and other countries. Some are on the water now, going abroad. I claim—and pardon my egotism—that I was the mover in this enterprise, and had you not coöperated with me as you did, it would not have been the success that it was.

Mr. **Seiler**. I move we now adjourn.

Mr. **Branson**. I second the motion.

The motion was agreed to, whereupon the society adjourned.

D. W. SEILER,
Secretary.

TREASURER'S REPORT.

John J. Nissley, *Treasurer, in account with Pennsylvania State Agricultural Society.*

1887.		*Dr.*		
Jan.	20.	Cash from J. B. Rutherford, former treasurer,	$258	97
	31.	Cash from railroad companies, freight refunded,	508	15
Apr.	9.	Cash from A. Wilhelm, temporary loan, rent of grounds,	125	00
	21.	Cash from C. Lippincott, Tr. Int. Ex. Stock,	1,599	90
		Ditto (Eisle Bros.),	1	80
		Ditto, order A. Wilhelm,	3	00
	25.	Ditto, order R. Nebinger and by him to W. Wilhelm,		90
May	24.	Cash from C. R. Hoopes, Chrm., for use of grounds,	100	00
Aug.	5.	Cash, State appropriation,	2,000	00
	31.	Amount included in order No. 174, premium due Wheeler & Wilson,	15	00
Sept.	17.	Cash for admission at exhibition at Philadelphia,	17,026	00
		Cash from concessions,	1,428	37
		Cash from baggage room,	17	80
		Cash from Thirteenth and Fifteenth Streets Railway Company,	500	00
		Cash from Pennsylvania railroad,	2,000	00
		Cash from entry fees,	1,851	09
		Cash from D. W. Seiler, Secretary, fifty annual members,	100	00
		Cash from grand stand,	1,307	95
		Cash from sale of school tickets,	1,013	20
		Cash from S. R. Wilson, cash refunded,	20	00
		Cash from Philadelphia and Atlantic City railroad tickets,	12	00
		Cash from Wilmington and Delaware railroad tickets,	2	50
		Cash from Philadelphia and Reading railroad, less $1,500, one year's interest on loan,	2,200	00

Sept. 17.	Cash from Pennsylvania railroad, freight refunded,	$364 73
	Cash from Wheeler & Wilson, premiums refunded for life members,	15 00
	Cash from G. W. Stitzel, annual membership,	2 00
		$32,473 36

1888.	*Cr.*	
Jan. 18.	Cash paid printing and advertising,	$2,710 46
	Cash paid insurance,	1,130 00
	Cash paid loan refunded to A. Wilhelm,	125 00
	Cash paid for premiums,	12,234 00
	Cash paid superintendents, watchman, labor, etc.,	3,018 49
	Cash paid coal, ice, show cases, gas, etc.,	703 40
	Cash paid improvements to buildings, etc.,	1,926 36
	Cash paid music,	500 00
	Cash paid hay, straw and feed,	1,310 31
	Cash paid transportation,	497 33
	Cash paid interest on loan and $100 on principal,	1,309 42
	Cash paid watchman's salary,	360 00
	Cash paid rent of grounds at Philadelphia and office at Harrisburg,	832 50
	Cash paid expenses Secretary's office,	898 10
	Cash paid expenses Treasurer's office,	125 00
	Cash paid balance of salary of J. S. Wilhelm,	300 00
	Cash paid Secretary's salary,	3,000 00
	Cash paid Treasurer's salary,	500 00
	Balance in treasury,	992 99
		$32,473 36
1888.		
Jan. 18.	Balance in treasury,	$992 99

The undersigned, committee to audit the accounts of John J. Nissley, Treasurer, report that we find it correct as stated, and a balance in his hands of nine hundred and ninety-two dollars and ninety-nine cents.

W. W. SPEER,
G. HIESTER,
JAS. R. PIPER.

LIST OF PREMIUMS AWARDED AT THE PENNSYLVANIA STATE AGRICULTURAL SOCIETY.

Thirty-Fourth Annual Exhibition, Philadelphia, September 3–15, 1888.

GROUP I.—Horses and Mules.

GRAND PRIZE.

J. Howard Lewis, Media, Passmore, Sylmar, The Banshee, Stampede and three of his get.

Your committee respectfully report that they award the grand prize of $50.00 to J. Howard Lewis, for Passmore, Sylmar and the Banshee the get of Stampede, all thoroughbreds.

Thos. J. Jordan,
Geo. W. Hill,
Judges.

CLASS 1.—Thoroughbreds.

5 and 6.	S. D. Riddle, Glen Riddle station, stallion over five years old, "Jim Carlisle," second premium, ...	$30 00
5.	J. Howard Lewis, Media, Pa., stallion over five years, "Stampede," first premium, ...	40 00
6.	J. Howard Lewis, Media, Pa., stallion between four and five years, "Swathmore," second premium, ...	30 00

Your committee respectfully report that they have awarded first premium of $30.00 for thoroughbred stallions to "Stampede," by Warden, out of "Dolly Morgan," aged———,and to "Swathmore," by "Stampede," out of "Blossom," between four and five years old, the first premium, of $30.00 and to "Jim Carlisle," the second premium of $30.00.

Thos. J. Jordan,
Geo. W. Hill,
Judges.

10.	J. Howard Lewis, brood mare and colt, "Blossom," first premium, ...	$40 00
	J. Howard Lewis, brood mare and colt, "Minnie Gentry," second premium of	25 00
11.	J. Howard Lewis, brood mare over for years old "Kate Long," second premium of	20 00
	S. D. Riddle, brood mare over four years "Witchcraft," first premium of, ...	30 00

Your committee respectfully report that they have awarded to "Blossom," by "Pat Malloy," dam "Viola," by "Ida Mallone," with colt at foot, the first prize of $40.00; and to "Nanny Gentry," by "Endeavour," by "Bell Scott," the second premium of $25.00; and to "Mare Witchcraft," the first premium of $30.00; being the best brood mare without colt at foot, and to "Kate Long," thoroughbred, the second prize of $20.00.

14. S. D. Riddle, filly between one and two years old, the "Banshee," first premium of	$15 00

Your committee respectfully report that they have awarded to the filly "Banshee," the first premium of $15.00, she by "Stampede," out of "Witchcraft."

THOS. J. JORDAN,
GEO. W. HILL,
Judges.

PENNSYLVANIA STATE FAIR.

By L. E. MACLEOD.

The "old and reliable" Pennsylvania State Agricultural Society held its thirty-fourth annual fair, at its grounds, Philadelphia, from September 3d to 15th, and, as usual, the show was a success. When, a year ago, the writer assisted at the same show in dealing out the red and blue badges to the equine candidates for honor in the ring, he discreetly "got out of town" before the awards were announced. However, this year the fair authorities invited me to again take a hand in adjusting the honors on the right bridles, and so I had the privilege of seeing the opening day. The judges of standard trotters were Mr. Frederich L. Griffin, of New York, Mr. Joseph Montgomery, of Harrisburg, and the writer—the former and latter using the scale of points. The fields were smaller than last year and there was less competition, but what there was was of rather better quality.

I never had better reason for confidence in the scale of points than after the last limited test at Philadelphia. Mr. Griffin, a horseman of close practical knowledge, and the writer applied the scale, independently and separately, without consultation, and neither knew what the other had marked on any point until the time came to foot up. Then we found our judgments so close that on very many points the figures were exactly the same, and on no animal did our totals differ five points, and on some not three points. (I enjoyed a similar experience last year in scoring with that excellent judge, Mr. Gurney C. Gue.) Moreover, the prize-winners shown by our cards were in every case those preferred for the awards by the other judge, Mr. Montgomery, a posted horseman of wide experience, and one whose judgment all who know him will thoroughly respect.

The premiums for standard trotters were arranged as follows:

CLASS 2.—STANDARD TROTTING STALLIONS, MARES AND FILLIES.

Must be standard under the rules established by the National Association of Trotting-Horse Breeders, and must be entered in Wallace's Trotting Register, and in case of stallions must give registry number.

15. Stallion over five years old.
16. Stallion between four and five years old.
17. Stallion between three and four years old.
18. Stallion between two and three years old.
19. Stallion between one and two years old.
20. Brood mare with foal at her foot.
21. Brood-mare over four years old.
22. Filly between three and four years old.
23. Filly between two and three years old.
24. Filly between one and two years old.

The scores of some of the premium winners are given in the accompanying table, according to Wallace's new Scale of Points:

Pennsylvania State Fair, September 3, 1888 —Score Sheet.—Class 2. Standard Trotters.

Structural Points.	Section 15.		Section 16.		Section 17.	Section 22		Section 24.	
	Perfection.	Storm King.	Hi Henry.	Sir Wilkes.	Riggoletto.	Mary Linn.	Rheta Almont.	Lindoletta.	Bright Eyes.
Head,	7	5	5½	4	5	4	3	5	4½
Neck.	5	4	4	4	3	2½	3	4	3
Shoulders, chest and forearms,	8	6	7	6	6	5	4½	6	5
Barrel and coupling,	8	5½	6½	5	6	4½	5	5½	5
Quarters, croup, stifles and gaskins,	10	8	8	6	8	6	7	7	7
Hocks,	8	6½	6½	4	6½	6½	6	6	6
Knees,	6	4½	4	3½	4	4	4	4	4
Cannons and pasterns,	6	5	4½	4	4½	4	4	5	3½
Feet,	10	8	5	6½	7	6	8	6	7½
Color and coat,	6	6	6	4	6	6	6	5	4½
Size and substance,	10	8½	7	6	7	7	8	8	7
Symmetry and style,	8	6	7	4	6½	6	5	6	5½
Action without speed,	8	7	7	4	7	5	6	5	7
	100	80	78	61	76½	66½	69½	72½	69½
Historical Points. (*For Registered Animals Only.*)									
Pedigree,	40	28	28	20	22½	30	20	24	20
Performance,	30								
Character of offspring,	30								
	200	108	106	81	99	96½	89½	96½	89½

Recapitulation.

Award.	Name.	Age.	Sire.	Dam.	Sire of Dam.	Structure	History.	Total.
1st	Storm King, 2161,	6	Happy Medium,	Topsy Taylor,	Norman, 25,	80	28	108
1st	Hi Henry, 4214,	4	Mambrino Dudley,	Virginia.	Volunteer,	78	28	106
2d	Sir Wilkes, 3528,	4	Young Jim,	Mary Mays,	Mambrino Patchen,	61	20	81
1st	Riggoletto, 4148,	3	Gen. Washington,	Gilda,	Jay Gould, 2:20½,	76½	22½	99
1st	Mary Linn,	3	Messenger Chief,	Rose Chief,	Brown Chief,	66½	30	96½
2d	Rheta Almont,	3	Alecto,	Cleopatra 2d,	Motion,	69½	20	89½
1st	Lindolette,	1	Epaulet, 2:19,	Lizzie C,	Mambrino Pilot,	72½	24	96½
2d	Bright Eyes,	1	Storm King,	Cleopatra 2d,	Motion,	69½	20	89½

L. E. Macleod,
Fred. L. Griffin.

In the class for stallions five years old and over, Mr. Daniel G. Engle had a walk-over with Storm King, and in the next class, for four-year old stallions, the same owner's Hi Henry, now quite a noted prize winner, rather easily out-classed Sir Wilkes. The latter was not shown to good advantage, his equipment being "too numerous," and the boy in charge not being exactly experienced. Storm King and Hi Henry are certainly a handsome pair, and Mr. Engle may well take pride in them. The son of Happy Medium has size, high form, adequate substance and good action. Hi Henry is built on slightly finer lines, but lacks a trifle in size. A mighty improved horse is Riggoletto, by Gen. Washington, out of Gilda, by Jay Gould. He is, by the way, a brother to the fast yearling Presto. I liked him pretty well last year, but he has shaped up greatly since then, and is now a right good colt in structure, though I would like him better were he just a shade larger. I class 24 two very handsome fillies competed for the first honors. Mr. Daniel G. Engle, of Marietta, Pa., the owner of Storm King and Hi Henry, showed Bright Eyes, by Storm King out of Cleopatra 2d, by Motion, 1544; and Mr. Corson, of Plymouth Meeting, Pa., showed Lindolette, by Epaulet, 2:19, out of Lizzie C, by Mambrino Pilot, 29. The competition between these two was close on structure. Lindolette having a trifle the best of it, and she also had the advantage in pedigree. Both fillies are highly creditable to their breeders and their sires and dams. In class 22 Mr Engle had it his own way, showing Rheta Almont, by Alecto (son of Almont) out of Cleopatra 2d by Motion, and Mary Linn, by Messenger Chief out of Rose Chief, the dam of Prince Wilkes, 2:14½. The grand daughter of Almont is rather a better individual than Prince Wilkes' half-sister, having a shade more substance, but the difference in structure was not nearly sufficient to overcome Mary Linn's advantage in pedigree. The blood of the dam of such a sterling campaigner as Prince Wilkes lends prestage to everything whose veins it enriches.

The score sheet furnishes further details of the relative merits of the various prize winners.

GRAND PRIZE No. 2.

2.	Daniel G. Engle, Marietta, Pennslyvania, four years old and under, "Radnor Bright Eyes" and sucking colt, first prize of	$50 00

CLASS 2.

15.	Daniel G. Engle, Marietta, Pennsylvania, stallion over five years old, "Storm King" (2160), first prize, . . .	40 00
16.	Daniel G. Engle, Marietta, Pennsylvania, stallion between four and five years, "Hi Henry" (4214), first prize, ...	30 00
16.	B. Crasson, Philadelphia, stallion between four and five years. "Sir Wilkes" (3228), second premium, ...	25 00
17.	G. and W. H. Corson, Plymouth Meeting, Pennsylvania, stallion between three and four years, "Riggoletta," first premium, ...	25 00
18.	Daniel G. Engle, Marietta, Pennsylvania, stallion between two and three, "Radnor" (5292), first premium,	15 00
19.	Daniel G. Engle, Marietta, Pennsylvania, stallion, "Englewood" (600), between one and two years, first premium,	15 00
20.	Daniel G. Engle, Marietta, Pennsylvania, brood mare and colt, "Julia G.," first premium, ...	40 00
21.	Daniel G. Engle, Marietta, Pennsylvania, brood mare over four years, "Instinct," first premium, ...	30 00
22.	Daniel G. Engle, Marietta, Pennsylvania, filly between three and four, "Mary Lynn," first premium, ...	20 00
	Daniel G. Engle, Marietta, Pennsylvania, filly, "Rhetta Almont," between three and four, second premium, .	15 00

24.	G. and W. H. Corson, Plymouth Meeting, Pennsylvania, filly between one and two years, "Lindalletta," first premium,	$15 00
24.	Daniel G. Engle, Marietta, Pennsylvania, filly between one and two, "Bright Eyes," second premium,	10 00

LESLIE E. MACLEOD,
FRED. L. GRIFFIN,
JOSEPH MONTGOMERY, *Judges.*

GRAND PRIZE No. 4.

S. K. Nissley, Florin, Pennsylvania, three colts, four years and under, the get of any coach, carriage or roadster stallion on exhibition, "Dolly," "Nellie" and "Billy," first prize,	$50 00

CLASS 3.

25.	S. K. Nissley, Florin, Pennsylvania, stallion, seven years, "Delgardo," second premium,	30 00
	A. R. Ladd, Philadelphia, stallion, fifteen years, "Hawthorn," first premium,	40 00
26.	M. Robinson, Jr., Paoli, stallion, four years, "Goldfinder," second premium,	25 00
	W. E. Phillips, Abrams, Pennsylvania, stallion between four and five years, "Kentucky Pride," first premium,	30 00
27.	William Shireman, stallion "Pertemont," between three and four years old, first premium,	25 00
28.	J. R. Mansfield, stallion "Hawthorne, Jr.," between two and three, second premium,	15 00
	Alexander Harris, Philadelphia, stallion between two and three, "Orphan Boy," first premium,	15 00
29.	M. Robinson, Jr., Paoli, Pennsylvania, stallion between one and two, "Valley Forge," second premium,	10 00
	M. Robinson, Jr., Paoli, Pennsylvania, stallion between one and two, "Cheveron," first premium,	15 00
30.	S. K. Nissley, Florin, Pennsylvania, brood mare and colt, "Belle," second premium,	25 00
30.	J. E. Phillips, Hooverton, Pennsylvania, brood mare and colt "Sadie," first premium,	40 00
31.	M. Robinson, Jr., Paoli, brood mare over four years, "Mollie B," first premium,	30 00
	E. L. Ashbridge, Cloud, Pennsylvania, brood mare over four, "Belle Thatcher," second premium,	20 00
32.	W. E. Phillips, Abrams, Pennsylvania, filly between three and four, "Sparkle," first premium,	20 00
33.	M. Robinson, Jr., Paoli, Pennsylvania, filly, between two and three, "Mona," second premium,	15 00
33.	R. C. Horr, Philadelphia, filly between two and three, "Ida C," first premium,	20 00
34.	S. K. Nissley, Florin, Pennsylvania, filly between one and two, "Della," first premium,	15 00
	J. R. Mansfield, Philadelphia, filly between one and two, "Florence Mambrino," second prize,	10 00

The foregoing is our award.

C. N. BARNARD, Avondale,
H. M. ASH, Secane, Pa.,
JOHN P. CROZER, Upland, Pa.,
Judges.

GRAND PRIZE No. 3.

4. S. K. Nissley, Florin, Pennsylvania, three colts, "Roudy," "Chauncy" and "Della," first premium, ...	$50 00

CLASS 4.

36. S. K. Nissley, Florin, Pennsylvania, stallion, over five years, "Killarn," second premium, ...	$30 00

CLASS 5.

46. Wm. Shireman, Middletown, Pennsylvania, stallion, over five years, "Bonnie Robin," first premium, ...	$40 00
Sellers Hoffman, Jr., Chadd's Ford, Pennsylvania, stallion, over five years, "Regie," second premium.	30 00
48. Delph & Gulden, Philadelphia. stallion, between three and four years, "Gondolier," first premium.	25 00
53. S. K. Nissley, Florin, Pennysylvania, filly, between one and two years, "Dolly," second premium, ...	10 00
W. E. Phillips, Anrams, Pennsylvania, filly, "Blossom," between two and three years, first premium, ...	15 00

The committee has awarded premium as marked in the book open opposite the names of winner.

H. E. HERSHEY,
WM. P. SERRILL,
SAMUEL L. WHITSON,
S. A. HUMMEL,
Judges.

CLASS 6.

55. A. R. Ladd, Philadelphia, pair coach horses, first premium.	$35 00
58. J. R. Mansfield. Philadelphia, Roadster, "Elizabeth Reviler," second premium, ...	15 00
Hoopes Marshall, Cloud, Pennsylvania, roadster, "Lady Goldsmith," first premium, ...	25 00
59. R. Patton, Philadelphia, children's pony, "Midgett," second premium, ...	5 00
Mrs. B. M. Goldberg, Philadelphia, children's pony, "Chip," first premium, ...	10 00

MORRIS W. HAYES,
J. H. LEWIS, JR.,
S. D. BIDDLE,
Judges.

CLASS 7.

Hunting, Saddle, High Jumping and Fancy Trained Horses.

Your judges respectfully report that they have awarded :

62. to S. D. Riddel's hunting stallion, "Jim Carlisle," the first prize of $25 00, to H. R. Poore's hunting mare, "Becky Sharp," first prize of $25 00, and to J. Howard Lewis' hunting gelding "Hercules" the first premium of $25 00.

GEORGE W. HILL,
THOS. J. JORDAN,
Judges.

65. H. G. Twaddell, West Philadelphia, hunting pony, "Robin," first premium, ...	$20 00

66.	J. Howard Lewis, hunting gelding, "Hercules,"	equal.
66.	H. R. Poore, Philadelphia, hunting mare, "Beckey Sharp,"	

To J. H. Lewis, the champion flag hunting saddle and bridle and to H. R. Poore, the hunting suit complete and crop.

GEO. W. HILL,
THOS. J. JORDAN,
Judges.

High Jumping Ponies, Under 14 1-2 Hands.

67.	H. G. Twaddell, Philadelphia, first premium, Hunting saddle.	
68.	Saddle horses:	
	W. W. Twaddell, "Prince Eugene," first premium,	$25 00
	A. R. Ladd, gelding, "Lightwood," second premium,	15 00
	J. Howard Lewis, Media, Philadelphia, hunting gelding, "Hercules," third premium,	10 00
68½.	H. G. Twaddell, French-Canadian pony, "Robin," first premium,	20 00
	Mrs. B. M. Goldberg, Philadelphia, mare, "Chip," second premium,	12 00

Your judges award to French-Canadian "Robin," first premium and to the mare "Chip," the second premium.

GEO. W. HILL,
THOS. J. JORDAN,
Judges.

67½. Children's ponies.

We awarded to J. H. Stovell's mare, "Minie," the first premium of $10 00.

GEO. W. HILL,
THOS. J. JORDAN,
Judges.

Holsteins.

90.	Lackawanna Breeding Association, Waverly, Pennsylvania, herd, Holstein cattle, first premium,	$75 00
	Wm. M. Singerley, herd, second premium,	40 00
91.	Lackawanna Breeding Association, Waverly, Pennsylvania, bull, over three years old, "Moiesiourd," first premium,	40 00
	D. T. Magie, Elizabeth, New Jersey, bull, over three years, "Waldemar," second premium,	30 00
92.	Caleb M. Walters, Seal, Pennsylvania, bull between two and three years, "Shadeland Sultan," first premium,	30 00
93.	Wm. M. Singerley, Philadelphia, bull, between one and two years, "Horatio S," first premium,	25 00
94.	Lackawanna Breeding Association, cow, over four years old, "Seitskerwanna," second premium,	30 00
	Wm. M. Singerley, Philadelphia, cow, over four years old, "Luraney," first premium,	40 00
95.	Lackawanna Breeding Association, cow, between three and four years, "Penina," second premium,	20 00
	Wm. M. Singerley, cow, between three and four years, "Fadlicnina," first premium,	30 00
96.	Lackawanna Breeding Association, heifer, between two and three years, "Chatta," second premium,	10 00

	Wm. M. Singerley, heifer, between two and three years, "Geneviva," first premium,	$20 00
97.	Lackawanna Breeding Association, heifer, between one and two, "Tramp Third," first premium,	15 00
97.	William M. Singerley, heifer, between one and two years, "Hillnora," second premium,	10 00

Herefords.

130.	W. H. Jones & Son, Montrose, Pennsylvania, herd, second premium,	40 00
	G. W. Millikin, Youngstown, Ohio, herd, first premium,	75 00
131.	W. H. Jones & Son, bull over three years old, "May Duke," second premium,	30 00
	G. W. Millikin, bull over three years old, "Listard," first premium,	40 00
133.	W. J. Jones & Son, bull, between one and two, "Durke," second premium,	20 00
	G. W. Millikin, bull between one and two, "Fremont," first premium,	25 00
134.	G. W. Milliikin, cow over four years old, "Favorite," second premium,	30 00
	G. W. Millkin, cow over four years old, "Easter Second," first premium,	40 00
135.	G. W. Millikin, cow between two and three years old, "Lady," first premium,	30 00
	G. W. Millikin, cow "Lott," between two and three years, second,	20 00
136.	G. W. Millikin, heifer, between two and three, "Lulu," first premium,	20 00
	G. W. Millikin, heifer, "Flora," second premium,	10 00
137.	G. W. Millikin, heifer, between one and two years, "Hattie," first premium,	15 00
138.	G. W. Millikin, best four heifers, first premium, (not under one year old, the get of any one bull),	20 00

S. R. DICKY,
JOHN HALL,
J. D. KIRKPATRICK,
Judges.

Devons.

80.	W. H. Jones & Son, herd, first premium,	$75 00
81.	W. H. Jones & Son, bull, over three years, "Retainer," first premium,	40 00
92	W. H. Jones & Son, South Montrose, bull, between two and three, "Defender," first premium,	30 00
82.	W. H. Jones & Son, bull, "Mortlake," between one and two years, second premium,	15 00
	W. H. Jones & Son, bull, "Revenue," first premium,	25 00
84.	W. H. Jones & Son, cow over four years, "Surprise," first premium,	40 00
	W. H. Jones & Son, cow, "Lena Pritchard," second premium,	25 00
85.	W. H. Jones & Son, cow, between three and four years, "Lady Lyndhurst," second premium,	20 00
86.	W. H. Jones & Son, heifer, between two and three, "Theressa," first premium,	20 00

87.	W. H. Jones & Son, heifer, between one and two, "Jennie May," second premium,	$10 00

Your committee would report that the Devon exhibit was by one exhibitor there being no competition, still we are free to say in all ways highly meritorious.

J. E. Piollet,
W. L. Archer,
Judges.

Ayrshires.

100.	J. O. Magie & Son, herd, second premium,	$40 00
	William Lindsay, Elizabeth, N. J., herd, first premium,	75 00
	J. O. Magie & Son, bull, "Stanley;" cow, "Bell Drummond," "Flora Drummond," "May Gold," "Dollie Gray," "Dolly Dot," special premium of the Ayershire Breeders' Association,	100 00
101.	J. O. Magie & Son, bull, "Stanley," over three years, second premium,	30 00
	William Lindsay, bull over three years, "MacDuff of Orwell," first premium,	40 00
	William Lindsay, bull, "Augustus Douglass,"	H. C.
102.	J. O. Magie & Son, bull, between three and two, "Duke of Elmore," first premium,	$30 00
	William Lindsay, bull, "Prince Union," second premium,	20 00
103.	J. O. Magie & Son, bull, between one and two, "Hugh Stanley," first premium,	25 00
	William Lindsay, bull, "Sir Drummond," second premium,	20 00
104.	J. O. Magie & Son, cow, four years, "Belle Drummond," first premium,	40 00
	William Lindsay, cow, four years, "Queen of Avon," and premium,	30 00
105.	J. O. Magie & Son, cow, between three and four, "May Gold 2d," second premium,	20 00
	William Lindsay, cow, "Miss Clarissa," first premium,	30 00
106.	William Lindsay, heifer, between two and three, "Lady Eumerides," first premium,	20 00
	William Lindsay, "Duchess of Hillside," second premium,	10 00
107.	J. O. Magie & Son, heifer, "Lady Philadelphia," between one and two, second premium,	10 00
	William Lindsay, heifer, "Star," between one and two, first premium,	15 00
108.	William Lindsay, four heifers, second premium, not under one year old, the get of any one bull,	10 00
	J. O. Magie & Son, four heifers, not under one year old, the get of any one bull, first premium,	20 00

Your committee are free to say the display of Ayreshires was full and competition very close, making it in some cases very difficult to determine as to the degrees of merit. The herd of one bull and five cows was decided after a good examination by the full committee.

J. E. Piollet,
W. Archer,
Louis Jack,
Judges.

Dr. E. A. Hertz exhibits two cows and their calves, bred from Chinese imported stock, while they are small and thin in flesh, they show remarkable quality for milk, and to all appearances make valuable family cows; from a view we should judge their weight not to exceed five hundred pounds each.

J. E. PIOLLET,
W. L. ARCHER,
Judges.

Jerseys.

110.	S. Kirkpatrick, Mt. Pleasant, Philadelphia, herd, first premium,	$75 00
	S. Kirkpatrick, Mt. Pleasant, Philadelphia, herd, second premium,	40 00

This herd was of great excellence and the cows deserving a special notice. Bull, "Binkle Pride," "Gold Bead," "Princess Ashantee," "Miss St. George," "Lady P. of Linden," first premium. "Golden Nuggett," "Bessie Bride," "Lady Abbess," "Star Grissetta," "Perrots Jewel," second premium.

111.	J. H. Burgin, Huntington Valley, bull over three years, "Tompetro," second premiums,	$30 00
	W C. Kerbaugh and Henry Bullock, Minersville, Pennsylvania, bull over three years, "Amy's Pretender," first premium,	40 00
112.	J. H. Burgin, bull, between two and three years, "Mary's Rioter," first premium,	30 00
	Freeman & Button, Cotton, New York, bull, between two and three, second premium,	20 00
113.	S. Kirkpatrick, Mt. Pleasant, Philadelphia, bull, between one and two, "Golden Nugget," first premium,	25 00
114.	S. Kirkpatrick, cow, over four years, "Gold Bead," first premium,	40 00
115.	S. Kirkpatrick, Mt. Pleasant, cow, between three and four, "Lady Pogis of Linden," first premium,	30 00
	S. Kirkpatrick, Mt. Pleasant, cow, "Perrots Jewel," second premium,	20 00
116.	S. Kirkpatrick, heifer, between two and three, "Star Grissets," first premium,	20 00
116.	J. H. Burgin, Huntington Valley, heifer, between two and three, "Pearline of Winikie," second premium,	10 00
117.	J. H. Burgin, Huntington Valley, heifer, between one and two "Victoria of Fair Oaks," second premium,	10 00
	J. H. Burgin, Huntington Valley, heifer, between one and two "Sabin Second," first premium,	15 00

Guernseys.

120.	William Lindsey, Elizabeth, New Jersey, herd, second premium,	40 00
	Ezra Michener, Carversville, Pennsylvania, herd, first premium,	75 00
121.	William Lindsay, bull, over three years, "Beau of Norwood," second premium,	30 00
	Joseph Crouch, bull, "General Dart," first premium,	40 00
122.	William Lindsay, bull, between two and three, "Champion Silver Cloud," second premium,	20 00

	Ezra Michener, bull, "Mohawk Gift," first premium,	20 00
123.	William Lindsay, bull, between one and two years, "Tax Payer," first premium,	25 00
124.	Ezra Michener, cow, over four years, "Hattie Woodward." first premium,	40 00
	Ezra Michener, cow, over four years, "Euphemia," second premium,	30 00
	Ezra Michener, cow, over four years, "Primrose de Castile," improved, third premium,	H. C.
125.	William Lindsay, cow, between three and four years old "Polly of Weston," second premium,	20 00
	Ezra Michener, cow, between three and four, "Miss Woodward," first premium,	30 00
126.	William Lindsay, heifer, between two and three, "Fire Fly," first premium,	20 00
127.	William Lindsay, heifer, between one and two years, "Fanny of Isle Fourth," first premium,	15 00
	Joseph Krouse, Roselle, New Jersey, heifer, between one and two, second premium,	10 00

We the undersigned have examined classes 12 and 13 Jerseys and Guernseys and have made the above awards as being in our judgment correct. Some of Class 12, were of very great excellence, especially the herd of cows exhibited by S. Kirkpatrick, and in some cases the competion was very close. We recommend that in the future you furnish your judges with printed scale of points for their guidance in making their awards.

Thomas Sharpless,
W. L. Grider.
Judges.

Merino Sheep.

151.	S. A. McCalmont, ram, two years and under four, second premium,	$10 00
	James Glass, Bergettstown, Pennsylvania, ram, two years and under four, first premium,	15 00
152.	S. A. McCalmont, ram, one year under two, first premium,	10 00
	James Glass, ram, one year under two, second premium,	5 00
153.	S. A. McCalmont, ram lamb, second premium,	5 00
	James Glass, ram lamb, first premium,	10 00
155.	S. A. McCalmont, pen three ewes, two years under four, second premium,	10 00
155.	James Glass, pen three ewes, two years under four, first premium,	15 00
156.	S. A. McCalmont, pen three ewes, one year under two, first premium,	15 00
	James Glass, pen three ewes, one year under two, second premium,	10 00
157.	S. A. McCalmont, pen three ewe lambs, first premium,	10 00
	James Glass, pen three ewe lambs, second premium,	5 00
160.	James Glass, Merino sweepstakes,	25 00

J. C. Thornton,
Committee.

CLASS 18.

161.	J. G. Paxton & Son, Houstonville, Pennsylvania, ram, two years and under four, "Greeley," first premium,	$15 00
161.	J. G. Paxton & Son, Houstonville, Pennsylvania, ram, two years and under four, "Seiler," second premium,	10 00
162.	J. G. Paxton & Son, ram, one year under two, first premium, ...	15 00
	James Glass, ram, one year under two, second premium,	10 00
163.	James Glass, ram lamb, second premium, ...	5 00
	J. G. Paxton & Son, ram lamb, first premium, ...	10 00
164.	James Glass, pen three ewes, two years and under four, first premium, ...	15 00
	J. G. Paxton & Son, pen three ewes, two years and under four, second premium, ...	10 00
165½.	James Glass, pen three ewes, one year and under two, second premium, ...	10 00
	J. G. Paxton & Son, pen three ewes, one year and under two, first premium, ...	15 00
166½.	James G. Paxton & Son, pen three ewe lambs, first premium, ...	10 00
167½.	J. G. Paxton & Son, pen two rams, any age, sweepstakes, ...	25 00

J. C. THORNTON,
JOHN G. CLARK,
Committee.

CLASS 19.

Southdowns.

165.	Jessie K. Cope, West Chester, Pennsylvania, ram, one year and under two, first premium, ...	$15 00
	J. G. Paxton & Son, Houstonville, Pennsylvania, ram, one year and under two, second premium, ...	10 00
166.	Jessie K. Cope, ram lamb, second premium, ...	5 00
	J. G. Paxton & Son, ram lamb, first premium, ...	10 00
167.	Jesse K. Cope, pen three ewes, two years and over, second premium, ...	10 00
	J. G. Paxton & Son, pen three ewes, three years and over, first premium, ...	15 00
168.	Jesse K. Cope, pen three ewes, one year and under two, second premium, ...	10 00
168.	J. G. Paxton & Son, pen three ewes, one year under two, first premium, ...	15 00
169.	Jesse K. Cope, pen three ewe lambs, first premium, . .	10 00
169.	J. G. Paxton & Son, pen three ewe lambs, second premium, ...	5 00

Other Middle Wooled.

171.	Lackawanna Breeding Association, Waverly, Pa., Shropshire lamb, one year under three, first premium, . .	15 00
	Lackawanna Breeding Association, Shropshire lamb, one year under three, second premium, ...	10 00
172.	Lackawanna Breeding Association, ram lamb, second premium, ...	5 00
	Caleb M. Walters, ram lamb, first premium, ...	10 00

173.	Lackawanna Breeding Association, pen three ewes, two years and over, second premium, ...	$10 00
	Caleb M. Walters, pen three ewes, two years and over, first premium, ...	15 00
174.	Lackawanna Breeding Association, pen three ewes, one year, under two, first premium, ...	15 00
	Caleb M. Walters, pen three ewes, one year under two, second premium, ...	10 00
175.	Caleb M. Walters, pen three ewe lambs, second premium, ...	5 00
	Charles T. Walter, pen three ewe lambs, first premium,	10 00
176.	Lackawanna Breeding Association, sweepstakes, . . .	25 00

CLASS 20.

Long Wools, &c.

181.	Caleb M. Walters, Seal, Pennsylvania, ram, one or under three, first premium, ...	$15 00
	Caleb M. Walters, Seal, Pennsylvania, ram one year under three, second premium, ...	10 00
182.	Caleb M. Walters, ram lamb, first premium, ...	10 00
	Caleb M. Walters, ram lamb, second premium, ...	5 00
185.	Caleb M. Walters, pen three ewes, two years or over, first premium, ...	15 00
	Caleb M. Walters, pen three ewes, two years and over, second premium, ...	10 00
184.	Caleb M. Walters, pen three ewes, one year under two, first premium, ...	15 00
	Caleb M. Walters, pen three ewes, one year under two, second premium, ...	10 00
185.	Caleb M. Walters, pen three ewe lambs, first premium,	10 00
	Caleb M. Walters, pen three ewe lambs, second premium, ...	5 00
186.	Caleb M. Walters, sweepstakes, ...	25 00

No competition, but a good lot of Lincolns.

James C. Roberts,
J. C. Thornton,
Alban P. Ingram, Sr.
Committee.

Hogs.

Chesters.

200.	A. Darlington Strode, White Chester boar, over two years, "Joe," second premium, ...	$10 00
	E. B. Ashbridge, Cloud, Pennsylvania, boar over two years, "Dandy," first premium, ...	18 00
201.	A. D. Strode, boar over one year, "Patron," first premium, ...	18 00
	Caleb M. Walters, boar, one year, second premium, . .	10 00
202.	A. D. Strode, boar, under one year, first premium, . .	12 00
	E. D. Ashbridge, boar, under one year, "Moody," second premium, ...	5 00
203.	E. B. Ashbridge, brood sow, over two years, second premium, ...	10 00
	Caleb M. Walters, brood sow, over two years, first premium, ...	18 00

204.	E B. Ashbridge, sow, over one year, first premium,	$12 00
	Caleb M. Walters, sow, over one one year, second premium,	6 00
205.	A. D. Strode, sow, under one year, first premium,	10 00
	Caleb M. Walters, sow, under one year, second premium,	5 00
206.	A. D. Strode, pen four sows, over six months, first premium,	18 00
	Caleb M. Walters, pen four sows, over six months, second premium,	10 0
207.	E. B. Ashbridge, pen five sows. under six months, second premium,	6 00
	Caleb M. Walters, pen four sows, under six months, first premium,	12 00

YORKSHIRES.

240.	W. H. Hunter & Son, Buffalo, Pennsylvania, boar, over two years, second premium,	10 00
241.	W. H. Hunter & Son, boar, over one year, second premium,	10 00
242.	W. H. Hunter & Son, boar, under one year, second premium,	5 00
	W. H. Hunter & Son, boar, under one year, second premium,	5 00
243.	W. H. Hunter & Son, brood sow, over two years, second premium,	10 00
244.	W. H. Hunter & Son, sow, over one year, first premium,	12 00
245.	W. H. Hunter & Son, sow, under one year, second premium,	5 00
247.	W. H. Hunter & Son, pen five sows, under six months, second premium,	6 00

CHESHIRES.

270.	Freeman & Button, Cotton, New York, boar, over two, second premium,	10 00
271.	Freeman & Button, boar, over one year, first premium,	18 00
272.	Freeman & Button, boar, under one year, second premium,	5 00
	S. S. Button, Chittenango, New York, boar, under one year, first premium,	12 00
273.	Freeman & Button, brood sow, over two years, first premium,	18 00
273.	G. S. Button, brood sow, over two years, second premium,	10 00
274.	Freeman & Button, sow, over one year, first premium,	12 00
275.	Freeman & Button, sow, under one year, second premium,	5 00
	G. S. Button, sow, under one year, first premium,	10 00
276.	Freeman & Button, pen five sows, over six months, second premium,	10 00
277.	Freeman & Button, New York, pen five sows, under six months, first premium,	12 00
277.	G. S. Button, pen five sows, under six months, second premium,	6 00

The exhibit of swine is very fine and the competition very close, especially in Class 21, to which we have given close attention.

Spencer F. Barber,
J. D. Kirkpatrick,
Judges.

Berkshires.

211.	S. C. Work & Son, Buffalo, Pennsylvania, boar, over one year, second premium, ...	$10 00
	Caleb M. Walters, Seal, Pennsylvania, boar, over one year, first premium, ...	18 00
212.	James Glass, boar, under one year, second premium, .	5 00
	Caleb M. Walters, boar, under one year, first premium,	12 00
213.	Caleb M. Walters, brood sow, over two years, first premium, ...	18 00
	Caleb M. Walters, brood sow, over two years, second premium, ...	10 00
214.	A D. Strode, sow, over one year, first premium, . . .	12 00
	S. C. Work & Son, Buffalo, Pennsylvania, sow, over one year, second premium, ...	6 00
215.	Caleb M. Walters, sow, under one year, first premium,	10 00
	Caleb M. Walters, sow, under one year, second premium,	5 00
216.	S. C. Work & Son, pen five sows, over six months, second premium, ...	10 00
217.	S. C. Work & Son, pen five sows, under six months, first premium, ...	12 00

J. C. Thornton,
Rufus Gheen,
James C. Roberts,
Committee.

Poland Chinas.

222.	S. A. McCalmont, boar, under one year, first premium,	$12 00
221.	S. A. McCalmont, boar, over one year, first premium, .	18 00
222.	Caleb M. Walters, boar, under one year, second premium, ...	5 00
223.	S. A. McCalmont, brood sow, over two years, first premium, ...	18 00
224.	S. A. McCalmont, sow, over one year, first premium, .	12 00
	S. A. McCalmont, sow, over one year, second premium,	6 00
225.	Caleb M. Walters, sow, under one year, second premium, ...	5 00
	James Glass, sow, under one year, first premium, . . .	10 00
227.	S. A. McCalmont, pen five sows, under six months, first premium, ...	12 00
	James Glass, pen five sows, under six months, second premium, ...	6 00

Rufus C. Gheen,
James C. Roberts,
John G. Clark,
Committee.

Jersey Reds.

230.	William Shireman, boar, over two years, first premium,	$18 00
232.	William Shireman, boar, under one year, first premium,	12 00

233.	William Shireman, brood sow, under two years, first premium,	$18 00

No competition, but good specimens of their breed.

RUFUS C. GHEEN,
JAMES C. ROBERTS,
Committee.

Essex.

254.	William Lindsay, sow, over one year, first premium,	$12 00
255.	William Lindsay, sow, under one year, first premium,	10 00
	William Lindsay, sow, under one year, second premium,	5 00

RUFUS C. GHEEN,
JAMES C. ROBERTS,
Committee.

GROUP V.—Poultry.

CLASS 29.

Light Brahmas.

B. F. Lewis, cock, second premium,	$1 00
S. S. Bossert, breeding pen, first premium,	3 00
S. S. Bossert, cock, first premium,	1 50
S. S. Bossert, breeding pen, second premium,	1 50
S. S. Bossert, cockerel, first premium,	1 50
S. S. Bossert, pullet, first premium,	1 50
Nevins & Cauffman, breeding pen, third premium,	1 00
Nevins & Cauffman, hen, second premium,	1 00
Nevins & Cauffman, hen, first premium,	1 50
Nevins & Cauffman, cockerel, second premium,	1 00
Nevins & Cauffman, pullet,	H. C.
Nevins & Cauffman, pullet, second premium,	1 00
A. H. Robinson, Philadelphia, cock,	H. C.
A. H. Robinson, hen,	H. C.

Buff Cochins.

John Bergman, Philadelphia, cockerel, first premium,	1 50
John Bergman, pullet, first premium,	1 50
Nevins & Cauffman, cock, second premium,	1 00
Nevins & Cauffman, hen, second premium,	1 00
A. H. Robinson, breeding pen, first premium,	3 00
A. H. Robinson, cock, first premium,	1 50
A. H. Robinson, hen, first premium,	1 50

Dark Brahmas.

S. H. Jackson, breeding pen, first premium,	3 00
S. H. Jackson, cock, first premium,	1 50
S. H. Jackson, hen, first premium,	1 50
S. H. Jackson, hen, second premium,	1 00
S. H. Jackson, pullet, first premium,	1 50

Langshans.

J. S. Cope, cock, first premium,	1 50
J. S. Cope, cock, second premium,	1 00
J. S. Cope, cockerel, first premium,	1 50

J. S. Cope, pullet, second, premium,	$1 00
B. F. Lewis, cock, second premium,	1 00
B. F. Lewis, hen, first premium,	1 50

Black Cochins.

B. F. Lewis, cock, first premium,	1 50
B. F. Lewis, hen, first premium,	1 50

Hamburgs.

SILVER SPANGLED HAMBURGS.

B. F. Lewis, Gwynedd, cock, first premium,	1 50
B. F. Lewis, hen, second premium,	1 00
B. F. Lewis, breeding pen, first premium,	3 00

SILVER PENCILED HAMBURGS.

Horace Grander, Reading, Pennsylvania, pen, second premium,	1 50
Horace Grander, cock, second premium,	1 00
Horace Grander, hen. second premium,	1 00
H. A. Beyler, Reading, Pennsylvania, breeding pen, first premium,	3 00
H. A. Beyler, cock, first premium,	1 50
H. A. Beyler, cockerel, first premium,	1 50
H. A. Beyler, hen, first premium,	1 50
H. A. Beyler, hen, first premium,	H. C.

GOLDEN PENCILED HAMBURGS.

Horace Grander, Readihg, Pennsylvania, breeding pen, first premium,	3 00
Horace Grander, cock, first premium,	1 50
Horace Grander, hen, second premium,	1 00
H. A. Beyler, cock, first premium,	1 00
H. A. Beyler, hen, first premium,	1 50

BLACK HAMBURGS.

Horace Grander, Reading, Pennsylvania, cock, first premium,	1 50
Horace Grander, hen, second premium,	1 00

Red Caps.

H. H. Hewitt, breeding pen, first premium,	3 00
H. H. Hewitt, hen, first premium,	1 50
H. H. Hewitt, hen, second premium,	1 00
H. A. Beyler, Peading, Pennsylvania, breeding pen, first premium,	3 00
H. A. Beyler, cock,	H. C.
H. A. Beyler, cock, second premium,	1 00
H. A. Beyler, hen, first premium,	1 50
H. A. Beyler, hen,	H. C.
H. A. Beyler, cockerel,	H. C.
H. A. Beyler, cockerel, first premium,	1 50
H. A. Beyler, pullet, second premium,	1 00
H. A. Beyler, pullet, first premium,	1 50
J. C. Maple, Trenton, New Jersey, cockerel, second premium,	1 00
J. C. Maple, pullet,	H. C.

H. H. Hewitt, breeding pen, first premium,	$3 00
H. H. Hewitt, hen, first premium,	1 50
H. H. Hewitt, hen, second premium,	1 00

White-faced Black Spanish.

Thomas Powell, Philadelphia, breeding pen, first premium,	3 00
Thomas Powell, cock, first premium,	1 50
Thomas Powell, hen, first premium,	1 50
Thomas Powell, cock, first premium,	1 50
Thomas Powell, pullet, first premium,	1 50
Thomas Powell, hen, second premium,	1 00

Black Minorca.

H. H. Hewitt, Williamsburg, Pennsylvania, cock,	H. C.
H. H. Hewitt, breeding pen, chicks, third premium,	1 00
H. H. Hewitt, cockerel, second premium,	1 00
H. H. Hewitt, pullet,	H. C.
S. H. Jackson, Swarthmore, breeding pen, first premium,	3 00
S. H. Jackson, cockerel, first premium,	1 50
S. H. Jackson, pullet, first premium,	1 50
S. H. Jackson, pullet, second premium,	1 00
S. H. Jackson, hen, second premium,	1 00
S. H. Jackson, breeding pen, second premium,	1 50
S. H. Jackson, cock, first premium.	1 50
A. H. Robinson, Philadelphia, cock, second premium,	1 00
A. H. Robinson, hen, first premium,	1 50
M. H. Leidy, Blooming Glenn, Pennsylvania, cockerel, first premium,	1 50
M. H. Leidy, pullet, first premium,	1 50
H. H. Hewitt, breeding pen, first premium,	3 00
H. H. Hewitt, cockerel, second premium,	1 00
H. H. Hewitt, pullet, second premium,	1 00

Andalusians.

R. Kaighn, Camden, New Jersey, breeding pen, first premium,	3 00
R. Kaighn, cockerel, second premium,	1 00
R. Kaighn, pullet, first premium,	1 50
R. Kaighn, pullet, second premium,	1 00

Brown Leghorns—Single-combed.

Caleb H. Toland, Fennwood, Pennsylvania, breeding pen, first premium,	3 00
Caleb H. Toland, cock, second premium,	1 00
Caleb H. Toland, hen, second premium,	1 00
Caleb H. Toland, breeding pen, second premium,	1 50
Caleb H. Toland, cockerel, first premium,	1 50
Caleb H. Toland, pullet, first premium,	1 50
B. F. Lewis, cock, first premium,	1 50
B. F. Lewis, hen,	H. C.
H. H. Hewitt, breeding pen, third premium,	1 00
Caleb H. Toland, cock,	H. C.
Caleb H. Toland, hen, first premium,	1 50

Brown Leghorns—Rose-combed.

S. S. Bossert, Pughtown, Pennsylvania, cock, first premium,	$1 50
S. S. Bossert, hen, first premium,	1 50
S. S. Bossert, cock,	H. C.
S. S. Bossert, hen, second premium,	1 00
Freeman & Button, Cottens, New York, cock, second premium,	1 00
Freeman & Button, hen,	H. C.
Freeman & Button, cock, second premium,	1 00
Freeman & Button, pullet, first premium,	1 50
Freeman & Button, cockerel, second premium,	1 00

White Leghorns—Single-combed.

B. F. Lewis, cock, second premium,	1 00
B. F. Lewis, hen, second premium,	1 00
B. F. Lewis, breeding pen, second premium,	1 50
H. A. Beyler, Reading, Pennsylvania, cockerel, first premium,	1 50
H. A. Beyler, pullet, first premium,	1 50
W. E. Gorman, Philadelphia, cockerel second premium,	1 00
W. E. Gorman, pullet, second premium,	1 00
S. H. Jackson, breeding pen, first premium,	3 00
S. H. Jackson, cock, first premium,	1 50
S. H. Jackson, hen, first premium,	1 50
S. H. Jackson, hen,	H. C.

White Leghorns—Rose-combed.

W. S. Miller, Reading, Pennsylvania, cock, first premium,	1 50
W. S. Miller, hen, first premium,	1 50
W. S. Miller, cockerel, first premium,	1 50
W. S. Miller, pullet, first premium,	1 50

Houdans.

G. S. Button, Chittenango, New York, cock, first premium,	1 50
G. S. Button, cock, first premium,	H. C.
G. S. Button, hen, first premium,	1 50
G. S. Button, cockerel, second premium,	1 00
G. S. Button, cockerel, first premium,	1 50
G. S. Button, pullet, second premium,	1 00
G. S. Button, pullet, first premium,	1 50
B. F. Lewis, cock, second premium,	1 00
B. F. Lewis, hen, second premium,	1 00

White-crested Black Polish.

S. S. Bossert, Pughtown, Pennsylvania, cock, second premium,	1 00
S. S. Bossert, hen, second premium,	1 00
S. S. Bossert, cock, first premium,	1 50
S. S. Bossert, hen, first premium,	1 50

Red Pile Games.

B. C. Thornton, hen, second premium,	1 00
B C. Thornton, hen, first premium,	1 50

Black Game.

B. C. Thornton, cock, first premium,	$1 50
B. C. Thornton, hen, first premium,	1 50
B. C. Thornton, cockerel, second premium,	1 00
B. C. Thornton, pullet, second premium,	1 00
H. H. Harmes, Phillipsburg, cock, second premium,	1 00
H. H. Harmes, hen, second premium,	1 00
H. H. Harmes, cockerel, first premium,	1 50
H. H. Harmes, pullet, first premium,	1 50

White Games.

B. C. Thornton, breeding pen, first premium,	3 00
B. C. Thornton, cock, first premium,	1 50
B. C. Thornton, hen, first premium,	1 50
H. H. Harmes, cock, second premium,	1 00
H. H. Harmes, hen,	H. C.

Brown-breasted Red Games.

J. A. Stovell, Philadelphia. breeding pen, first premium,	3 00
J. A. Stovell, cock, first premium,	1 50
J. A. Stovell, hen, first premium.	1 50
J. A. Stovell, hen, second premium,	1 00
J. A. Stovell, cockerel, first premium,	1 50
J. A. Stovell, pullet, first premium,	1 50
J. A. Stovell, pullet, second premium,	1 00

Black-breasted Red Games.

B. C. Thornton, breeding pen, first premium,	3 00
B. C. Thornton, cock, first premium,	1 50
B. C. Thornton, hen, first premium,	1 50
B. C. Thornton, hen, second premium,	1 00

Yellow Duckwing Games.

Jos. Krouse, Russell, N. J., cock, first premium,	1 50
Jos. Krouse, pullet, first premium,	1 50

Silver Duckwing Games.

Jos. Krouse, cock, first premium,	1 50
Jos. Krouse, hen, first premium,	1 50

Brown-breasted Red Game Bantams.

J. G. Darlington, breeding pen, second premium,	1 50
J. G. Darlington, hen,	H. C.
J. G. Darlington, hen, first premium,	1 50
J. G. Darlington, cock, second premium,	1 00
J. G. Darlington, hen, second premium,	1 00
J. G. Darlington, cockerel,	H. C.
John Filker, Orange, N. J., cock, first premium,	1 50
John Filker, pullet, first premium,	1 50
John Filker, cockerel, first premium,	1 50
John Filker, pullet, second premium,	1 00
John Filker, breeding pen,	3 00

B. C. Thornton, breeding pen, third premium,	$1 00
B. C. Thornton, cock,	H. C.
B. C. Thornton, cockerel, second premium,	1 00
B. C. Thornton, pullet,	H. C.

Silver Duckwing Game Bantams.

J. G. Darlington, breeding pen, first premium,	3 00
J. G. Darlington, cock, first premium,	1 50
J. G. Darlington, hen,	H. C.
J. G. Darlington, hen, first premium,	1 50
J. G. Darlington, pullet, first premium,	1 50
J. G. Darlington, cockerel, first premium,	1 50
J. G. Darlington, pullet, second premium,	1 00
J. S. Tomlinson & Bro., breeding pen, third premium,	1 00
J. S. Tomlinson, cockerel, second premium,	1 00
J. S. Tomlinson, pullet,	H. C.
J. C. Maple, breeding pen, second premium,	1 50
J. C. Maple, cock, second premium,	1 00
J. C. Maple, hen, second premium,	1 00

Yellow Duckwing Game Bantams.

J. G. Darlington, cock,	H. C.
J. G. Darlington, hen, first premium,	1 50
B. F. Lewis, cock, first premium,	1 50
B. F. Lewis, hen, first premium,	1 50
B. C. Thornton, cock, first premium,	1 50
Horace Grander, hen,	H. C.
J. C. Maple, breeding pen, first premium,	1 50
J. C. Maple, cock, second premium,	1 00
J. C. Maple, hen, second premium,	1 00
J. C. Maple, pullet, first premium,	1 50

Red Pile Game Bantams.

John Filken, cock, first premium,	1 50
John Filken, breeding pen, first premium,	3 00
John Filken, pullet, first premium,	1 50
B. C. Thornton, hen, first premium,	1 50
B. C. Thornton, hen, second premium,	1 00
H. A. Beyler, cock,	H. C.
J. C. Maple, hen, second premium,	1 00
J. C. Maple, cock, second premium,	1 00
J. C. Maple, hen,	H. C.
B. C. Thornton, breeding pen, third premium,	1 00
B. C. Thornton, cock, first premium,	1 50

White Pile Game Bantams.

H. A. Beyler, cock, second premium,	1 00
H. A. Beyler, hen,	H. C.
J. C. Maple, breeding pen, first premium,	3 00
J. C. Maple, cock, first premium,	1 50
J. C. Maple, hen, first premium,	1 50
J. C. Maple, hen, second premium,	1 00
J. C. Maple, pullet, first premium,	1 50

Buff Pekin Bantams.

B. F. Lewis, cock, ...	H. C.
B. F. Lewis, hen, first premium, ...	$1 50
B. F. Lewis, cockerel, first premium, ...	1 50
B. F. Lewis, cockerel, second premium, ...	1 00
B. F. Lewis, cock, first premium, ...	1 50
Nevins & Cauffman, cock, second premium, ...	1 00
Nevins & Cauffman, hen, second premium, ...	1 00
J. S. Tomlinson, cock, first premium, ...	1 50
J. S. Tomlinson, hen, first premium, ...	H. C.
B. F. Lewis, breeding pen, first premium, ...	3 00

Black Rose-combed Game Bantams.

J. C. Maple pen, second premium, ...	1 50
J. C. Maple, cock, second premium, ...	1 00
J. C. Maple, pullet, second premium, ...	1 00
Horace Grander, hen, second premium, ...	1 00
Nevins & Cauffman, hen, ...	H. C.
H. A. Beyler, breeding pen, first premium, ...	3 00
H. A. Beyler, cock, first premium, ...	1 50
H. A. Beyler, cock, ...	H. C.
H. A. Beyler, hen, first premium, ...	1 50
H. A. Beyler, cockerel, first premium, ...	1 50
H. A. Beyler, pullet, ...	H. C.
Horace Grander, breeding pen, third premium, ...	1 00

Black Tail Japanese Bantams.

Nevins & Cauffman, breeding pen, first premium, ...	3 00
Nevins & Cauffman, cock, first premium, ...	1 50
Nevins & Cauffman, hen, first premium, ...	1 50
Nevins & Cauffman, hen, second premium, ...	1 00
Nevins & Cauffman, white cock, first premium, ...	1 50
Nevius & Cauffman, white pullet, first premium, ...	1 50
Nevins & Cauffman, gray cock, first premium, ...	1 50
Nevins & Cauffman, gray pullet, first premium, ...	1 50

White Rose-combed Bantams.

J. C. Maple, breeding pen, first premium, ...	3 00
J. C. Maple, cock, first premium, ...	1 50
J. C. Maple, hen, first premium, ...	1 50
J. C. Maple, hen, second premium, ...	1 00
J. C. Maple, pullet, first premium, ...	1 50
J. C. Maple, cockerel, first premium, ...	1 50

White Single-combed Bantams.

J. C. Maple, breeding pen, first premium, ...	3 00
J. C. Maple, cock, first premium, ...	1 50
J. C. Maple, hen, first premium, ...	1 50
J. C. Maple, hen, second premium, ...	1 00
J. C. Maple, booted pullet, first specimen, ...	1 50

White Polish Bantams.

Nevins & Cauffman, cock, second premium, ...	1 00
Nevins & Cauffman, hen, second premium, ...	1 00

Nevins & Cauffman, bearded cockerel, first premium,	$1 50
Nevins & Cauffman, bearded pullet, first premium,	1 50
J. C. Maple, cock, first premium,	1 50
J. C. Maple, hen, first premium,	1 50

Golden Seabright Bantams.

H. A. Beyler, cock, second premium,	1 00
H. A. Beyler, hen,	H. C.
J. C. Maple, breeding pen, first premium,	3 00
J. C. Maple, cock, first premium,	1 50
J. C. Maple, hen, second premium,	1 00
J. C. Maple, hen, first premium,	1 50
J. C. Maple, cockerel, first premium,	1 50

Silver Seabright Bantams.

H. A Beyler, hen,	H. C.
J. C. Maple, breeding pen, first premium,	3 00
J. C. Maple, cock, first premium,	1 50
J. C. Maple, hen, first premium,	1 50
J. C. Maple, hen, second premium,	1 00
J. C. Maple, pullet, first premium,	1 50
J. C. Maple, cockerel, first premium,	1 50

Patridge Cochins.

S. H. Jackson, cockerel, second premium,	1 00
S. H. Jackson, pullet, first premium,	1 50
S. H. Jackson, cock, second premium,	1 00
S. H. Jackson, hen, first premium,	1 50
H. Vernier, Jr., breeding pen, second premium,	1 50
H. Vernier, Jr., cockerel, first premium,	1 50
H. Vernier, Jr., pullet, second premium,	1 00
A. H. Robinson, breeding pen, first premium,	3 00
A. H. Robinson, cock, first premium,	1 50
A. H. Robinson, hen, second premium,	1 00
A. H. Robinson, hen,	H. C.

American Dominiques.

Jesse G. Darlington, breeding pen, first premium,	3 00
Jesse G. Darlington, cockerel, first premium,	1 50
Jesse G. Darlington, pullet, first premium,	1 50
Jesse G. Darlington, cockerel, second premium,	1 00
Jesse G. Darlington, pullet, second premium,	1 00
Jesse G. Darlington, cock, first premium,	1 50
Jesse G. Darlington, hen, first premium,	1 50
Jesse G. Darlington, hen, second premium,	1 00

Plymouth Rocks.

Joseph B. Edge, breeding pen, second premium,	1 50
B. F. Lewis, cock,	H. C.
H. H. Hewitt, cockerel, second premium,	1 00
H. H. Hewitt, pullet,	H. C.
L. H. Hewitt, cockerel, first premium,	1 50
H. H. Hewitt, pullet, first premium,	1 50
J. S Cope, breeding pen, first premium,	3 00

J. S. Cope, cock, first premium,	$1 50
J. S. Cope, hen,	H. C.
Model Bee Hive Company, breeding pen, third premium,	1 00
Model Bee Hive Company, hen, first premium,	1 50
Model Bee Hive Company, hen, second premium,	1 00
Freeman & Button, cock, second premium,	1 00

Wyandottes.

B. F. Lewis, cock, second premium,	1 00
B. F. Lewis, breeding pen, third premium,	1 00
M. H. Leidy, breeding pen, third premium,	1 50
M. H. Leidy, cockerel, third premium,	1 00
M. H. Leidy, pullet,	H. C.
Benton Jones, Philadelphia, breeding pen, first premium,	3 00
Benton Jones, cockerel, first premium,	1 50
Benton Jones, pullet, second premium,	1 00
Benton Jones, pullet, first premium,	1 50
Benton Jones, cock,	H. C.
Benton Jones, hen, second premium,	1 00
Benton Jones, hen,	H. C.
M. H. Leidy, cock, first premium,	1 50
M. H. Leidy, hen, first premium,	1 50
J. T. Harker, breeding pen, first premim,	3 00
J. T. Harker, cockerel, first premium,	1 50
J. T. Harker, pullet, first premium,	1 50
J. T. Harker, pullet, second premium,	1 00
J. T. Harker, hen, second premium,	1 00
J. T. Harker, hen, first premium,	1 50

White Plymouth Rocks.

Freeman & Button, cockerel, first premium,	1 50
Freeman & Button, pullet, first premium,	1 50
H. H. Hewitt, cock, second premium,	1 00
H. H. Hewitt, hen, second premium,	1 00
H. H. Hewitt, pullet, second premium,	1 00
S. S. Bassert, cock, first premium,	1 50
Joseph B. Edge, cockerel,	H. C.
Joseph B. Edge, pullet, second premium,	1 00

Silver Gray Dorkings.

W. W. Wagner, breeding pen, second premium,	1 50
W. W. Wagner, cockerel, second premium,	1 00
W. W. Wagner, pullet, second premium,	1 00
W. W. Wagner, hen,	H. C.
W. W. Wagner, hen, second premium,	1 00
B. F. Lewis, cock, first premium,	1 50
B. F. Lewis, hen, second premium,	1 00
J. S. Cope, cockerel,	H. C.
J. S. Cope, pullet,	H. C.
J. S. Cope, pullet, first premium,	1 50
J. S. Cope, cockerel, first premium,	1 50
J. S. Cope, cock, first premium,	1 50
J. S. Cope, hen, first premium,	1 50
J. S. Cope, breeding pen, first premium,	3 00
J. S. Cope, cock, second premium,	1 00

Colored Dorkings.

Freeman & Button, cockerel, first premium,	$1 50
Freeman & Button, pullet, second premium,	1 00
Freeman & Button, pullet, first premium,	1 50
Freeman & Button, cockerel, second premium,	1 00

Black Javas.

H. H. Hewitt, breeding pen, first premium,	3 00
H. H. Hewitt, cock, first premium,	1 50
H. H. Hewitt, hen, second premium,	1 00
H. H Hewitt, hen, first premium,	1 50

Rumpless,

B. F. Lewis, cock, first premium,	1 50
B. F. Lewis, hen, first premium,	1 50

Frizzled.

B. F. Lewis, cock, first premium,	1 50
B. F. Lewis, hen, first premium,	1 50
B. F. Lewis, cock, second premium,	1 00
B. F. Lewis, hen, second premium,	1 00
R. C. Kaighn, cockerel, first premium,	1 50
R. C. Kaighn, pullet, first premium,	1 50

Japanese Silkies.

J. C. Maple, cock, first premium,	1 50
J. C. Maple, hen, first premium,	1 50
J. C. Maple, hen, second premium,	1 00

Turkeys.

BRONZE.

B. F. Lewis, one pair, first premium,	$2 00
H. H. Hewitt, one pair second premium,	1 50

WHITE HOLLAND TURKEYS.

B. F. Lewis, one pair, first premium,	2 00

CLASS 30.

Geese.

TOULOUSE.

B. F. Lewis, one pair, first premium,	2 00
B. F. Lewis, one pair,	H. C.
Freeman & Button, one pair, second premium,	1 50

WHITE CHINA.

B. F. Lewis, one pair, first premium,	2 00

EMBDEN.

Freeman & Button, one pair, first premium,	2 00
Freeman & Button, one pair, second premium,	1 50

WILD.

B. F. Lewis, one pair, first premium,	2 00

Ducks.

ROUEN.

P. Powell, one pair, second premium,	$1 50
G. S. Button, one pair, first premium,	2 00
B. F. Lewis, one pair,	H. C.

AYLESBURG.

B. F. Lewis, one pair, first premium,	2 00

PEKIN.

B. F. Lewis, one pair,	H. C.
J. L. Harris, one pair, first premium,	2 00
A. H. Robinson, one pair, second premium,	1 50

MUSCOVY.

B. F. Lewis, one pair, white, second premium,	1 50
B. F. Lewis, one pair, colored, first premium,	2 00

WHITE CRESTED.

B. F. Lewis, one pair, second premium,	1 50
H. H. Hewitt, one pair, first premium,	2 00

BLACK.

H. H. Hewitt, one pair, first premium,	2 00
H. H. Hewitt, one pair, crested, first premium,	2 00

CAYUGA.

Freeman & Button, one pair, first premium,	2 00

CLASS 31.

Pigeons and Cage and Ornamental Birds.

TUMBLERS.

H. W. Vahle, Blue Booted, second premium,	75
H. W. Vahle, Red Inside, first premium,	1 00
H. W. Vahle, Black Mottled, first premium,	1 00
J. G. Darlington, Yellow Bald, first premium,	1 00
J. G. Darlington, Blue Bald, first premium,	1 00
J. G. Darlington, Yellow Parlor, second premium,	75
Wm. Ehringer, Jr., Red Bald, first premium,	1 00
Wm. Ehringer, Jr., Blue Button Head Bald, first premium,	1 00
Martin Hoepfner, Black Beard, first premium,	1 00
Martin Hoepfner, Blue Brunswick, first premium,	1 00
B. F. Lewis, Black, first premium,	1 00
J. L. Harris, Red Parlor, second premium,	75
J. L. Harris, Blue German, first premium,	1 00
Fred. L. Baily, Shirt Faced, first premium,	1 00
J. A. Stovell, Yellow Inside, first premium,	1 00
J. A. Stovell, Red Inside, first premium,	1 00
J. A. Stovell, Yellow Mottled Inside, first premium,	1 00

FANTAILS.

H. W. Vahle, White, second premium, ...	$0 75
H. W. Vahle, White Booted, first premium, ...	1 00
H. W. Vahle, Blue Booted, first premium, ...	1 00
H. W. Vahle, Black Booted. first premium, ...	1 00
H. W. Vahle, Black, second premium, ...	75
H. W. Vahle, White Crested, second premium, ...	75
H. W. Vahle, White Crested, first premium, ...	1 00
H. W. Vahle, White Crested, ...	H. C.
H. W. Vahle, White Crested, ...	H. C.
F. L Baily, White, first premium, ...	1 00
J. A. Stovell, Black, ...	H. C.
J. A. Stovell, Black, first premium, ...	1 50
J. A. Stovell, Blue Crested, second premium, ...	75

TURBETS.

H. W. Vahle, Red Tail, first premium, ...	1 00
J. G. Darlington, Yellow, second premium, ...	75
J. G. Darlington, Blue, first premium, ...	1 00
W. Ehringer, Jr., White, second premium, ...	75
W. Ehringer, Jr., Blue Tail, first premium, ...	1 00
W. Ehringer, Jr., Black, ...	H. C.
W. Ehringer, Jr., Yellow, first premium, ...	1 00
W. Ehringer, Jr., Red, first premium, ...	1 00
W. Ehringer, Jr., Blue, first premium, ...	1 00
W. Ehringer, Jr., Black, first premium, ...	1 00
J. A Stovell, blue tail, second premium, ...	75
J. A. Stovell, blue tail, ...	H. C.
J. A. Stovell, white, first premium, ...	1 00
J. A. Stovell, red, first premium, ...	1 00
J. A. Stovell, black, second premium, ...	75
J. A. Stovell, yellow, ...	H. C.
J. S. Harris, black, first premium, ...	1 00
J. A. Stovell, German high-flyers, first premium, ...	1 00
J. A. Stovell, German high-flyers, second premium, ...	75
M. Hoepfner, yellow, first premium, ...	1 00
M. Hoepfner, yellow wings, second premium, ...	75
M. Hoepfner, black tail, second premium, ...	75

DRAGONS.

J. L. Harris, red, first premium, ...	1 00

MAGPIES.

H. W. Vahle, blue, second premium, ...	75
H. W. Vahle, black, second premium, ...	75
H. W. Vahle, yellow, ...	H. C.
H. W. Vahle, red, second premium, ...	75
H. W. Vahle, yellow, second premium, ...	75
W. Ehringer, Jr., yellow, first premium, ...	1 00
W. Ehringer, Jr., yellow-crested, first premiums, ...	1 00
W. Ehringer, Jr., red-crested, ...	H. C.
W. Ehringer, Jr., red-crested, first premium, ...	1 00
W. Ehringer, Jr., dun-crested, first premium, ...	1 00

W. Ehringer, Jr., blue-crested, first premium,	$1 00
W. Ehringer, Jr., black-crested, first premium,	1 00
W. Ehringer. Jr., black P. H., first premium,	1 00
F. L. Bailey, black,	H. C.

JACOBINS.

H. W. Vahle, black, second premium,	75
H. W. Vahle, blue, second premium,	75
H. W. Vahle, white bar, red shield, first premium,	1 00
J. G. Darlington. white, first premium,	1 00
J. G. Darlington, red, second premium,	75
J. G. Darlington, dun, first premium,	1 00
J. G. Darlington, blue, first premium,	1 00
J. G. Darlington, silver ash, first premium,	1 00
W. Ehringer, Jr., black,	H. C.
W. Ehringer, Jr., yellow,	H. C.
W. Ehringer, Jr., red,	H. C.
F. L Baily, yellow, first premium,	1 00
F. L. Baily, white, second premium,	75
F. L. Baily, black, first premium,	1 00
F. L. Baily, red, first premium,	1 00

MOORCAPS.

H. W. Vahle, black, second premium,	75
M. Hoepfner, Mooreheads, first premiums,	1 00
M. Hoepfner, plain Mooreheads,	H. C.
J. A. Stovell, black, first premium,	1 00

STARLINGS.

M. Hoepfner, black, first premium,	1 00

SNELLS.

W. Ehringer, Jr., black tail, first premium,	1 00
W. Ehringer, Jr., blue tail, first premium,	1 00

TRUMPETERS.

H. W. Vahle, dun, first premium,	1 00
H. W. Vahle, black bald, first premium,	1 00
H. W. Vahle, black bald, first premium,	1 00
H. W. Vahle, white, first premium,	1 00
M. Hoepfner, horned, first premium,	1 00

QUAKERS.

M. Hoepfner, blue, first premium,	1 00
M. Hoepfner, blackshield, first premium,	1 00
M. Hoepfner, starling, second premium,	75
M. Hoepfner, mottled shield, second premium,	75
J. A. Stovell, mottled shield, first premium,	1 00

BLONDINETS.

H. W. Vahle, black, first premium,	1 00
J. A. Stovell, blue, first premium,	1 00

ARCHANGLES.

H. W. Vahle, second premium,	$0 75
M. Hoepfner, first premium,	1 00

ANTWERPS.

B. F. Lewis, silver, second premium,	75
B. F. Lewis, red check, second premium,	75
J. L. Harris, white, first premium,	1 00
J. L. Harris, black, second premium,	75
J. L. Harris, silver, first premium,	1 00
J. L. Harris, silver crested, first premium,	1 00
J. L. Harris, smoky blue, first premium,	1 00
J. A. Stovell, ash, first premium,	1 00
J. A. Stovell, black, first premium,	1 00
J. A. Stovell, blue, first premium,	1 00
J. A. Stovell, ash, first premium,	1 00
J. A. Stovell, blue check, second premium,	75
J. A. Stovell, blue check, first premium,	1 00
J. A. Stovell, red check, first premium,	1 00

PRUSTS.

M. Hoepfner, black, first premium,	1 00

ENGLISH OWLS.

W. H. Vahle, red sirges, first premium,	$1 00
J. G. Darlington, silver,	H. C.
W. Ehringer, Jr., blue, first premium,	1 00
W. Ehringer, Jr., blue muffed, second premium,	75
W. Ehringer, Jr., silver, first premium,	1 00
W. Ehringer, Jr., blue tail, first premium,	1 00
W. Ehringer, Jr , yellow, first premium,	1 00
W. Ehringer, Jr., dun, first premium,	1 00
W. Ehringer, Jr., white, first premium,	1 00
W. Ehringer, Jr., black tail, second premium,	75
J. L. Harris, blue, second premium,	1 00
F. L. Baily, blue muffed, first premium,	1 00
J. A. Stovell, blue,	H. C.
J. A. Stovell, blue, second premium,	75
J. A. Stovell, white, second premium,	75
J. A. Stovell, yellow, second premium,	75
J. A. Stovell, black, first premium,	1 00
J. A. Stovell, blue check, first premium,	1 00
J. A. Stovell, ash, first premium,	1 00
J. A. Stovell, silver, second premium,	75
J. A. Stovell, black tail, second premium,	75
J. A. Stovell, black tail, first premium,	75

AFRICAN OWLS.

J. G. Darlington, blue, second premium,	75
J. A. Stovell, blue,	H. C.
J. A. Stovell, white, first premium,	1 00
J. A. Stovell, blue, first premium,	1 00
J. A. Stovell, black,	H. C.

J. A. Stovell, blue	H. C.
J. A. Stovell, yellow, first premium,	$1 00
H. W. Vahle, white Chinese, first premium,	1 00
J. L. Harris, white Chinese, second premium,	75
J. L. Harris, red, first premium,	1 00
J. L. Harris, white,	H. C.

Ice.

M. Hoepfner, mottled, first premium,	1 00
M. Hoepfner, plain, first premium,	1 00

Spots.

M. Hoepfner, black, first premium,	1 00
M. Hoepfner, red, first premium,	1 00

Swallows.

H. W. Vale, blue check, first premium,	1 00
H. W. Vahle, red, first premium,	1 00
H. W. Vahle, blue, first premium,	1 00
H. W. Vahle, yellow, first premium,	1 00
H. W. Vahle, black, second premium,	75
H. W. Vahle, red snipe, first premium,	1 00
H. W. Vahle, black barred,	H. C.
H. W. Vahle, white barred, first premium,	1 00
H. W. Vale, white barred, black, second premium,	75
W. Ehringer, Jr., red, second premium,	75
W. Ehringer, Jr., blue,	H. C.
M. Hoepfner, blue, first premium,	1 00
M. Hoepfner, black, first premium,	1 00
M. Hoepfner, blue, second premium,	75
J. L. Harris, yellow, second premium,	75
F. L. Baily, blue barred, second premium,	75
F. L. Baily, black, first premium,	1 00

Ring Doves.

H. W. Vahle,	H. C.
A. McKinley, first premium,	1 00
A. McKinley, second premium,	75

Runts.

H. W. Vahle, black German, first premium,	1 00
J. L. Harris, white,	1 00

Barbs.

H. W. Vahle, white, first premium,	1 00
H. W. Vahle, black, second premium,	75
W. Ehringer, Jr., red, second premium,	1 00
W. Ehringer, Jr., black, second premium,	1 00

Carriers.

H. W. Vahle, blue, first premium,	1 00
H. W. Vahle, black, first premium,	1 00

H. W. Vahle, dun, first premium,	$1 00
J. Krouse, blue, second premium,	75

White Doves.

H. W. Vahle, first premium,	1 00
H. W. Vahle, Anstrahan, first premium,	1 00

Pouters.

F. L. Baily, blue pied, first premium,	1 00

CLASS 32.

Fur-bearing Pets.

Rabbits.

B. F. Lewis, one pair Madagascar, first premium,	50
B. F. Lewis, one pair Angora,	50
B. F. Lewis, one pair Belgian,	50
B. F. Lewis, one pair English,	50

Guinea Pigs.

B. F. Lewis, one pair white smooth, first premium,	50
B. F. Lewis, one pair colored rough, first premium,	50
B. F. Lewis, one pair white rough, first premium,	50
B. F. Lewis, one pair colored smooth, first premium,	50

Guinea Fowls.

B. F. Lewis, white, first premium,	1 00
B. F. Lewis, white, second premium,	75
B. F. Lewis, pearl, first premium,	1 00
B. F. Lewis, pearl, second,	75

Chinese Silver Pheasants.

Jesse N. Rooke, silver, first premium,	2 00
Jesse N. Rooke, golden, first premium,	2 00

Incubators.

G. A. McFetridge, State incubator, first premium,	15 00
G. A. McFetridge, State brooder, first premium,	8 00
Keystone Incubator Company, Keystone incubator, second premium,	10 00
Keystone incubator Company, Keystone brooder, second premium,	2 00
W. H. Walters, Pressy incubator, third premium,	5 00
W. H. Walters, Pressy brooder, third premium,	1 00

GROUP VI.—Industrial Insects.

CLASS 33.—Bees.

485. S. W. Morrison, Oxford, Pennsylvania, Italian bees, colony in hive with movable frames, first premium,	$5 00
H. W. Twining, Oxford, Pennsylvania, colony Italian bees, second premium,	Diploma.

488.	S. W. Morrison, Oxford, Carniola bees, in hive with movable frame, first premium, new race, lately imported from Austria,	$5 00
490.	S. W. Morrison, queen rearing in Neucleus Observatory hives, first premium,	5 00
	H. M. Twining, queen rearing in Neucleus Observatory hives, second premium,	Diploma.
491.	S. W. Morrison, best and largest number of queen cells, &c., first premium,	5 00
	H. M. Twining, best and largest number of queen cells, second premium,	Diploma.
492.	S. W. Morrison, queen bees, any race, first premium, fine exhibit,	5 00

CLASS 34.—Honey and Wax.

495.	Model Bee Hive Company, comb honey collection,	Diploma.
496.	C. W. Lutglens, Hammonton, New Jersey, comb honey, best ten pounds.	Diploma.
497.	Model Bee Hive Company, best extraction of honey,	Diploma.
498.	C. H. Lutgon, extracted honey, best ten ponnds,	Diploma.
500.	Model Bee Hive Company, best and largest collection of honey,	Diploma.

CLASS 35.—Hives and Appliances.

512.	Model Bee Hive Company, sample comb foundation, remarkably fine,	Diploma.
514.	F. Danzenbaker, honey rack,	Diploma.
515.	F. Danzenbaker, new bee hive, of special merit,	Diploma.
517.	H. M. Twining, most skilful transferring of combs, &c., from hive to hive, first premium,	$5 00
518.	H. M. Twining, manipulation, first premium,	5 00
519.	H. M. Twining, extraction of honey from comb without injury to brood.	

The committee make the foregoing awards.

J. HASBROUCK, New Brunswick, N. J.,
Judge.

CLASS 39a.

560.	C. A. Beaver, Philadelphia, condensed milk, best collection,	Diploma.
562.	Lester Milk Company, Philadelphia, pure milk in glass jars,	Diploma.
674.	P. C. Hiller, Conestoga, Pennsylvania, one bushel red wheat, first premium,	$3 00
677.	R. C. Kaighn, one sheaf bearded wheat, first premium,	2 00
679.	R. C. Kaighn, Camden, New Jersey, display of wheat, second premium,	3 00
679.	J. M. Kaighn & Son, Camden, N. J., display of wheat, first premium,	5 00
690.	George D. Field, wild or native maize, first premium, on the ear, three or more stalks bearing ears,	3 00
691.	R. C. Kaighn, collection of ten or more varieties on the stalk, not less than three stalks of a sort, first premium,	5 00
694.	J. M. Kaighn & Son, oats, either variety, handsomest sheaf, first premium,	2 00

699.	R. C. Kaighn, sorghum, six or more stalks of any variety, collection, second premium,	$2 00
704.	J. M. Kaighn & Son, broom corn, display of ten stalks, two or more varieties, second premium,	2 00

Your committee appointed to judge in Classes 43 and 44 beg leave to state that exhibits in these classes were light and many of which we did not consider worthy of award, and all of which were meritorious, the premiums were marked accordingly.

D. H. BRANSON,
JOHN H. DOYLE,
ALFRED E. YERKES,
SAMUEL WHITSON,
Committee.

Vegetables, Etc.

733.	R. C. Kaighn, potatoes, fifty varieties, second premium,	$5 00
	J. M. Kaighn & Son, potatoes, fifty varieties, first premium,	10 00
734.	J. M. Kaighn & Son, potatoes, twenty varieties, one peck each. first premium,	5 00
735.	J. M. Kaighn & Son, potatoes, five varieties, one peck each, second premium,	3 00
	De Long & McFarland, potatoes, five varieties, one peck each. first premium,	5 00
737.	J. M. Kaighn & Son, potatoes, American seedlings, first premium,	5 00
738	George D. Field, sweet potatoes, one half bushel, red, second premium,	1 00
740.	George D. Field, sweet potatoes, one-half bushel, yellow, second premium,	1 00
741.	George D. Field, yams, one-half bushel, first premium,	2 00
743.	George D. Field, onions, six white flat, second premium,	1 00
	De Long & McFarland, onions, six white flat, first premium,	2 00
744.	George D. Field, onions, six white round, second premium,	1 00
	De Long & McFarland, onions, six white round, first premium,	2 00
745.	George D. Field, onions, six red flat, first premium,	2 00
746.	George D. Field. onions, six red round, first premium,	2 00
747.	J. M. Kaighn & Son, onions, six yellow flat, second premium,	1 00
	De Long & McFarland, onions, six yellow flat, first premium.	2 00
748.	George D. Field, onions, six yellow round, first premium,	2 00
749.	George D. Field. onions, foreign collection, first premium,	2 00
750.	George D. Field, onions, general collection, first premium.	5 00

Leeks.

751.	George D. Field, leeks, twelve specimens, first premium,	2 00
752.	George D. Field, radishes, six turnip form, second premium,	1 00
	J. M. Kaighn & Son, radishes, six turnip form, first premium,	2 00

753.	George D. Field, radishes, six specimens, three varieties, half long form, second premium,	$1 00
	J. M. Kaighn & Son, radishes, six specimens of each, three varieties, half long form, first premium,	2 00
754.	J. M. Kaighn & Son, radishes, six specimens, each of three varieties, long form, second premium,	1 00
755.	George D. Field, radishes, six specimens, winter varieties, second premium,	1 00
756.	J. M. Kaighn & Son, cattle feeding roots, second premium,	5 00
756.	George D. Field, cattle feeding roots, first premium,	10 00
757.	J. M. Kaighn & Son, carrots for table use, twelve specimens, three varieties, first premium,	2 00
759.	George D. Field, carrots, collection of six or more varieties, first premium,	2 00
760.	George D. Field, beets, table use, twenty-four specimens, second premium,	2 00
	J. M. Kaighn & Son, table beets, twenty-four specimens, first premium,	3 00
762.	George D. Field, mangolds, long red, six specimens, first, premium,	2 00
764.	George D. Field, mangolds, six yellow globe, first premium,	2 00
765.	George D. Field, mangolds, six golden tankard, first premium,	2 00
769.	George D. Field, turnips, table use, twelve specimens white flesh, first premium,	2 00
772.	George D. Field, ruta baga, twenty specimens purple top, yellow flesh, second premium,	2 00
774.	R. C. Kaighn, parsnips, display twelve roots, long variety, first premium,	2 00
775.	J. M. Kaighn & Sons, parsnips, twelve specimens long, second premium,	1 00
775.	J. M. Kaighn & Son, parsnips, twelve varieties round, second premium,	1 00
776.	R. C. Kaighn, salsify, twelve roots, first premium,	2 00
	George D. Field, salsify, twelve roots, second premium,	1 00
777.	J. M. Kaighn & Son, scorzenorera, twelve roots, second premium,	1 00

Green Vegetables, etc.

780.	R. C. Kaighn, green vegetable, twenty varieties, second premium,	10 00
	George M. Field, green vegetables, twenty varieties, first premium,	Report.
781.	R. C. Kaighn, forage plants, dry, first premium,	$3 00
	J M. Kaighn & Son, forage plants, dry, second premium,	2 00
785.	J. M. Kaighn & Sons, cucurbitaceous display, first premium,	Report.
	George D. Field, cucurbitaceous display, second premium,	$10 00
786.	George D. Field, watermelons, collection, second premium,	5 00
787.	George D. Field, watermelons, most perfect, first premium,	3 00

788.	George D. Field, watermelons, three oblong, first premium,	$2 00
789.	George D. Field, watermelons, three ovate dark skinned, first premiums,	2 00
791.	George D. Field, watermelons, three ovate light shinned, first premium,	2 00
792.	George D. Field, watermelons, heaviest, any kind, first premium,	3 00
793.	R. C. Kaighn, watermelons, foreign, first premium,	3 00
794.	J. M. Kaighn & Son, canteloupes, collection, second premium,	5 00
	George D. Field, canteloupes, collection, first premium,	10 00
795.	George D. Field, canteloupes, three globular, first premium,	2 00
796.	George D. Field, canteloupes, three oblong, first premium,	2 00
799.	George D. Field, canteloupes, heaviest of any kind, first premium,	2 00
802.	R. C. Kaighn, squashes, summer, collection, first premium,	2 00
	J. M. Kaighn & Son, squashes, summer,	1 00
803.	R. C. Kaighn, squashes, three varieties, twelve specimens, first premium,	2 00
	George D. Field, squashes, three varieties, second premium,	1 00
804.	J. M. Kaighn & Son, squashes, best summer foreign varieties, second premium,	1 00
	George D. Field, squash, best summer foreign variety, first premium,	2 00
805.	J. M. Kaighn & Son, squashes, winter, collection, second premium,	1 00
	George D. Field, squashes, winter, collection, first premium,	2 00
806.	J. M. Kaighn & Son, squashes, twelve specimens, first premium,	2 00
	George D. Field, squashes, twelve specimens, second premium,	1 00
807.	George D. Field, squash, best winter hard variety, first premium,	2 00
808.	George D. Field, squash, most promising foreign, second premium,	1 00
810.	J. M. Kaighn & Son, pumpkins, nine specimens, three varieties, first premium,	2 00
	R. C. Kaighn, pumpkin, nine specimens, three varieties, second premium,	1 00
812.	J. M. Kaighn & Son, pumpkin, most promising foreign, first premium,	3 00
814.	R. C. Kaighn, pumpkin, heaviest specimen, first premium,	5 00
	J. M. Kaighn & Son, pumpkin, heaviest, second premium,	3 00
817.	J. M. Kaighn & Son, cucumbers, Fieldsport, five specimens, second premium,	1 00
	John Sherer, cucumbers, Fieldsport, first premium,	2 00
829.	J. M. Kaighn & Son, gourds, collection, first premium,	2 00

819.	George D. Field, gourds, collection, second premium,	$1 00
822.	George D. Field, beans, American bush, second premium,	1 00
	John Sherer, beans, American bush, first premium,	2 00
823.	R. C. Kaighn, beans, American pole, first premium,	2 00
825.	George D. Field, cabbage, six flat head, first premium,	2 00
826.	George D Field, cabbage, six specimens conical head, second premium,	1 00
827.	George D. Field, cabbage, "Savoy," second premium,	1 00
828.	George D. Field, cabbage, general collection, first premium,	3 00
829.	George D. Field, cauliflour, six heads, first premium,	3 00
830.	George D. Field, celery, six stalks dwarf white, first premium,	2 00
831.	George D. Field, celery, six stalks tall white, first premium,	2 00
833.	George D. Field, egg plant, four long round purple, first premium,	3 00
835.	B. C. Kaighn, Kohl Rabi, twelve specimens, second premium.	1 00
836.	George D. Field, lettuce, six heads, first premium,	2 00
837.	George D. Field, lettuce, six head cross varieties, first premium,	2 00
840.	J. M. Kaighn & Son, Okra Pods, first premium,	2 00
	George D. Field, Okra Pods, second premium,	1 00
841	R. C. Kaighn, peppers, twenty specimens, four varieties, first premium,	2 00
	George D. Field, peppers, twenty specimens, four varieties, second premium,	1 00
842.	J. M. Kaighn & Son, peppers, six Bell Nose, second premium,	1 00
	John Sherer, peppers, six bell nose, first premium,	2 00
844.	R. C. Kaighn, peas, most showy dish, first premium,	2 00
844.	George D. Field, peas, most showy dish, second premium,	1 00
845.	J. M. Kaighn & Son, rhubarb, six stalks, second premium,	1 00
	George D. Field, rhubarb, six stalks, first premium,	2 00
847.	George D. Field, tomatoes, nine in a dish, second premium,	1 00
	William Bradley, Balla, Pennsylvania, tomatoes, nine in a dish, first premium,	2 00
848.	George D. Field, tomatoes, not less than nine varieties collection of thirty, first premium,	5 00
953.	Mrs. Samuel Atkinson, Chestnut Hill, cans tomatoes, ten cans, second premium,	1 00

The judges in classes forty five and forty six respectfully report that they have given the exhibits a careful examination and awarded premiums as herewith stated.

J. A. HERR,
WILLIAM H. HOLSTEIN,
Committee.

Fruits.

973.	J. M. Kaighn & Son, Camden, New Jersey, fruit of all kinds, second premium,	$10 00

	William Parry, Camden, New Jersey, fruits of all kinds, first premium,	$15 00

Grapes.

981.	Joel Horner & Son, Merchantville, New Jersey, native grapes, largest number, first premium,	30 00
982.	William Parry, Parry, New Jersey, native grapes thirty varieties, second premium,	10 00
	Joel Horner & Son, Merchantville, New Jersey, native grapes, largest number, thirty varieties, first premium,	15 00
983.	William Parry, native grapes, collection of twenty varieties, first premium,	10 00
	Joel Horner & Son, native grapes, twenty varieties, second premium,	5 00
984.	William Parry, native grapes, ten varieties, second premium,	3 00
	P. C. Hiller, native grapes, ten varieties, first premium,	5 00
985.	P. C. Hiller, Concord grapes, second premium,	1 00
	Joel Horner & Son, Concord grapes, first premium,	2 00
986.	William Parry, Martha grapes, second premium,	1 00
	Joel Horner & Son, Martha grapes, first premium,	2 00
987.	P. C. Hiller, Clinton grapes, second premium,	1 00
	Joel Horner & Son, Clinton grapes, first premium,	2 00
988.	William Parry, Niagara grapes, first premium,	2 00
	Joel Horner & Son, Niagara grapes, second premium,	1 00
989.	William Parry, Brighton grapes, second premium,	1 00
	P. C. Hiller, Brighton grapes, first premium,	2 00
990.	William Parry, Catawba Grapes, second premium,	1 00
	Joel Horner & Son, Catawba Grapes, first premium,	2 00
991.	Joel Horner & Son, Delaware grapes, first premium,	2 00
992.	William Parry, Rogers' Hybrids grapes, Salem, second premium,	1 00
	Joel Horner & Son, Rogers' Hybrids grapes No. 28, first premium,	2 00
993.	William Parry, Lutie, new variety, second premium,	1 00
	Joel Horner & Son, new variety, first premium,	2 00
994.	William Parry, Woodruff Hardy, new variety, second premium,	1 00
994.	Joel Horner & Son, Hardy, new variety, first premium,	2 00

Peaches.

995.	P. C. Hiller, ten varieties, first premium,	10 00
997.	P. C. Hiller, Late Crawfords, first premium,	2 00
998.	P. C. Hiller, Susquehanna, second premium,	1 00
999.	P. C. Hiller, Reeves' Favorite, second premium,	1 00
1003.	P. C. Hiller, Stump, six varieties, first premium,	2 00
1004.	P. C. Hiller, Old Mixon Free, first premium,	2 00
1006.	P. C. Hiller, basket peaches, six varieties, second premium,	2 00
1007.	P. C. Hiller, peaches, general collection, second premium,	10 00

Plums.

1008.	P. C. Hiller, twelve varieties, second premium,	1 00
	Joel A. Herr, twelve varieties, first premium,	2 00
1009.	William Parry, half peck, second premium,	2 00

Pears.

1010.	William Parry, best and largest collection,	$20 00
1011.	William Parry, fifty varieties, second premium,	10 00
1013.	William Parry, twenty varieties, first premium,	10 00
	P. C. Hiller, twenty varieties, second premium,	5 00
1015.	William Parry, ten varieties, second premium,	3 00
	P. C. Hiller, ten varieties, first premium,	5 00
1017.	R C. Kaighn, Camden, New Jersey, Bartletts, second premium,	1 00
	William Parry, Bartletts, first premium,	2 00
1018.	J. M. Kaighn & Son, Seckle, second premium,	1 00
	J. A. Herr, Seckle, first premium,	2 00
1020.	William Parry, Beurre D'Angou, first premium,	2 00
	P. C. Hiller, Beurre D'Angou, second premium,	1 00
1021.	William Parry, Doyenne Boussack, first premium,	2 00
1022.	R. C. Kaighn, Lawrence, first premium,	2 00
	L. Montford, Lawrence, second premium,	1 00
1023.	J. M. Kaighn & Son, Sheldon, first premium,	2 00
	P. C. Hiller, Sheldon, second premium,	1 00
1024.	J. A. Herr, Flemish Beauty, second premium,	1 00
1025.	William Parry, Belle Lucrative, second preminm,	1 00
	P. C. Hiller, Belle Lucrative, first premium,	2 00
1026.	William Parry, Howell, first premium,	2 00
	P. C. Hiller, Howell, second premium,	1 00
1027.	J. M. Kaighn & Son, Duchesse D'Angouleme, first premium,	2 00
	L. Montfort, Duchesse D'Angouleme, second premium,	1 00
1028.	R. C. Kaighn, Louise Donne, second premium,	1 00
	J. A. Herr, Louise Donne, first premium,	2 00
1030	J. M. Kaighn & Son, Winter Nellis, first premium,	2 00
	P. C. Hiller, Winter Nellis, second premium,	1 00
1034.	William Parry, La Conte, new variety, second premium,	1 00
	P. V. Hiler, new variety, first premium,	2 00

Apples.

1034.	J. A. Herr, Herr's Seedling, favorable mention as a promising new variety.	
1035.	William Parry, six fall varieties, first premium,	3 00
	J. A. Herr, six fall varieties, second premium,	2 00
1036.	J. M. Kaighn & Son, six winter varieties, second premium,	2 00
	William Parry, six winter varieties, first premium,	3 00
1037.	R. C. Kaighn, basket six varieties, best arranged, first premium,	5 00
	William Parry, basket six varieties, best arranged, second premium,	2 00
1038.	William Parry, twenty-five varieties, collection, second premium,	10 00
	P. C. Hiller, twenty-five varieties, collection, first premium,	20 00
1040.	William Parry, best collection ten varieties, three specimens each, first premium,	10 00
	P. C. Hiller, best collection ten varieties, three specimens each, second premium,	5 00

1042.	J. M. Kaighn & Son, Baldwin, best twelve specimens, second premium,	$1 00
1042.	P. C. Hiller, Baldwin, best twelve specimens, first premium,	2 00
1043.	P. C. Hiller, York Imperial, best twelve, second premium,	1 00
1044.	P. C. Hiller, Smith's Cider best twelve, second premium,	1 00
	Joel Horner & Son, Smith's Cider, best twelve, first premium,	2 00
1054.	J. M. Kaighn & Son, Rhode Island Greening, best twelve, first premium,	2 00
	P. C. Hiller, Rhode Island Greening, best twelve, second premium,	1 00
1046.	J. M. Kaighn & Son, King of Tompkins County, best twelve, second premium,	1 00
	P. C. Hiller, King of Tompkins County, best twelve, first premium,	2 00
1047.	J. M. Kaighn & Son, Northern Spy, best twelve, first premium,	2 00
	P. C. Hiller, Northern Spy, best twelve, second premium,	1 00
1048.	J. M. Kaighn & Son, Smokehouse, best twelve, first premium,	2 00
	P. C. Hiller, Smokehouse, best twelve, second premium,	1 00
1049.	J. M. Kaighn & Son, Maiden's Blush, best twelve, second premium,	1 00
	Joel Horner, Maiden's Blush, best twelve, first premium,	2 00
1050.	P. C. Hiller, Rambo, best twelve, second premium,	1 00
	John Sherer, Rambo, best twelve, first premium,	2 00
1051.	J. A. Herr, Pound, best twelve, first premium,	2 00
	William Parry, Pound, best twelve, second premium,	1 00
1052.	William Parry, Golden Russett, best twelve, first premium,	2 00
1053.	William Parry, Hubbardson Nonsuch, first premium,	2 00
	P. C. Hiller, Hubbardson Nonsuch, second premium,	1 00
1054.	J. M. Kaighn & Son, Porter, three specimens, first premium,	2 00
	Joel Horner, Porter, three specimens, second premium,	1 00
1056.	William Parry, any other variety, best twelve, second premium,	1 00
	P. C. Hiller, any other variety, best twelve, first premium,	2 00
1057.	J. M. Kaighn & Son, six fall varieties, three each, first premium,	5 00
	William Parry, fall varieties, three each, second premium,	2 00
1058.	J. M. Kaighn & Son, six winter varieties, 3 each, second premium,	2 00
	P. C. Hiller, six winter varieties, three each, first premium,	5 00
1059.	P. C. Hiller, basket, six varieties best arranged, second premium,	2 00
	John Sherer, basket, six varieties best arranged, first premium,	5 00

1060.	William Parry, quinces, best collection, five varieties, six each, second premium,	$2 00
1062.	R. C. Kaighn, quinces, best arranged basket, second premium,	2 00
1064	George D. Field, blackberries, Wilson, one quart, first premium,	1 00
1072.	J. M. Kaighn, walnuts, cultivated, best peck, first premium,	1 00
1073.	R. C. Kaighn, walnuts, uncultivated, first premium,	1 00
1079.	Mrs. Samuel Atkinson, Chestnut Hill, jellies, ten jars, first premium,	3 00

The undersigned committee in this department would respectfully report that we have attended to our duties this day, and having examined the various exhibits, have awarded the premiums herein set forth.

GABRIEL HEISTER,
CYRUS T. FOX,
GEORGE D. STITZEL,
Committee.

GROUP 13—Farinaceous Products.

CLASS 49.

1985. The George V. Hecker flour from winter wheat is entitled to the first premium for whiteness, purity and strength. The biscuit and griddle cakes produced whilst the committee was present were not to be surpassed.

1096. The wheat granules exhibited by the same party seemed to be of excellent quality.

1098. The self-raising buckwheat flour of which the committee witnessed the process, can hardly be equalled and certainly not excelled in rapidity and excellence of production.

CLASS 50.

Bread and Pastry.

1113. The exhibits under this head are undeserving of notice, such home-made bread should be scarce.

CLASS 51.

Sugars.

1118. Queen Anne syrup is entitled to very favorable notice, and would recommend *bronze medal.*

CLASS 52.

Tobacco.

1126. Johnston & Co., North Tenth street, Philadelphia, a very fine display of cigars and leaf tobacco, ... Dipolma.

1126. Gray, Morales & Co.'s exhibit of cigars is creditable and deserving of especial notice. The committee would also recommend bronze medal.

1144. The only creditable exhibition of wines was that of the Florida Wine Company, who are entitled to a medal.

JOHN W. MISH,
HIRAM YOUNG,
J. SCHALL WILHELM,
Committee.

GROUP 15—Ornamental Plants and Flowers.

CLASS 55.

Cut Flowers and Designs.

1190.	Bude's bouquet, Hugh Graham's Son, first premium,	$5 00
1192.	Six corsage bouquets, Hugh Graham's Son, first premium,	5 00
1193.	Plateau cut flowers, La Roch & Stahl, first premium,	10 00
1194.	Plateau of ferns and foliage, Haddon floral house, first premium,	5 00
1194.	Plateau of ferns and foliage, Hugh Graham's Son, second premium,	3 00
1195.	Handle basket of cut flowers, Hugh Graham's Son, first premium,	5 00
1197.	Three designs of immortelles, Philadelphia Immortelles Design Company, first premium,	10 00
1197.	Three designs of immortelles, La Roch & Stahl, second premium,	5 00
1207.	China asters, Mrs. E. D. De Maris, first premium,	3 00
1207.	China asters, O. R. Kreinberg, second premium,	2 00
	Special premium—Pansies, zimas and cut flowers, O. R. Kreinberg,	5 00
1215.	Large design of cut flowers, Hugh Graham's Son, first premium,	50 00
1215.	Large design of cut flowers, John Graham, second premium,	30 00
1215.	Large design of cut flowers, La Roch & Stahl, third premium,	20 00

MARY J. STILLE,
O. R. KREINBERG,
JAMES R. PIPER,
Judges.

GROUP 16—Transportation.

CLASS 56.

Freight and Business Vehicles.

1239.	Kennett Wagon Company, Kennett Square, Pa., self-dumping wagon,	Report.
	Useful, convenient and an excellent wagon for the purpose designed.	
1245.	Parvin Iron Wagon Company, Penn's Grove, N. J., iron wagons,	Diploma.
1245.	Samuel Taylor, Avondale, Pa., farm wagons,	Diploma.
1245.	Acme Wagon Company, Emigsville, Pa., farm wagons, best collection,	Diploma.
	The automatic brake exhibited very ingenious and effective.	
1247.	George Lengert & Son, Philadelphia, light and heavy express wagon,	Diploma.
1247.	Jacob Rich & Son, Philadelphia, platform spring wagon,	Diploma.
1249.	Fred Marty, Philadelphia, business wagons,	Diploma.
1249.	A. H. English, wagons, six springs,	Report.
	Excellent material, good taste in construction, and superior workmanship.	

1251. J. Rich & Son, Philadelphia, open-side milk wagon, . Report.
Design good, very convenient for customer as well as dealer, finish superior.
1257. George M. Reeser, Bird-in-Hand, Pa., improved wagon jack, ... Diploma.
1258. Townsend Wickersham, New Garden, Pa., paris green distributing wagon, ... Diploma.
1259. Robert Exley, Philadelphia, sprinkling wagon, . . . Diploma.
Studebaker Bros., South Bend, Ind., simplicity and durability, ... Diploma.

CLASS 57.

Pleasure Carriages.

1260. A. H. English, Philadelphia, Surry carriage, ... Report.
The material, style and workmanship excellent.
1260. McLear & Kendall, Philadelphia, Brougham, ... Diploma.
1261. A. H. English & Co., standing top carriage, ... Diploma.
1262. A. H. English & Co., Victoria, ... Report.
Material very superior, unique, tasty, style, good workmanship, excellent finish, seemingly a complete carriage.
1262. Union Machine Company, close standing top and folding top carriages—6 carriages, ... Diploma.
1262. L. M. Landis, Lansdale, Pennsylvania, depot wagon, . Diploma.
1263. McLear & Kendall, Philadelphia, rockaway, ... Diploma.
McLear & Kendall, Philadelphia, rockaway, ... Diploma.
1264. Mellinger Patent Phaeton Company, standing top phaeton, ... Diploma.
1264. A. H English & Co., doctor's phaeton, ... Diploma.
1264. L. M. Landis, top surry, ... Diploma.
1264. L. M. Landis, no top surry, ... Diploma.
1264. McLear & Kendall, phaeton, ... Diploma.
1265. Mellinger Patent Phaeton Company, standing top, shifting seat phaeton, ... Diploma.
Mellinger Patent Phaeton Company, falling top, shifting seat, ... Diploma.
Mellinger Patent Phaeton Company, standing top depot carriage, report very superior in design and a very remarkably convenient carriage to enter or alight from, ... Diploma.
1265. Mellinger Patent Phaeton Company, falling extension top phaeton; seats change from four to six seat passenger carriage. Report the style, workmanship and design are all highly commendable, and the novelty and convenience unsurpassed, ... Diploma.
1266. McLear & Kendall, buggy, ... Diploma.
J. A. Rich & Son, Corning buggy, ... Diploma.
1267. L. M. Landis, Landsdale, Pennsylvania, top buggy, . Diploma.
1268. Union Machine Company, Philadelphia, road cart, . . Diploma.
1268. Crap & Swope, Philadelphia, road carts, ... Diploma.
1268. Samuel V. Beaumont, Philadelphia, speed carts, . . Diploma.
Samuel V. Beaumont, Philadelphia, road carts, . . . Diploma.
1269. Union Machine Company, Philadelphia, sleighs, . . Diploma.

1272. Clifton Buggy Works, Clifton Heights, Pennsylvania, combined park buggy, ... Diploma.

ABNER RUTHERFORD,
WM. TAYLOR,
Committee.

GROUP 17—Miscellaneous.

CLASS 58.

1300. A. W. Straub, Philadelphia, Quaker City grinding mill, ... Diploma.
1300. S. P. Kase, Philadelphia, oyster shell grinding mill. This mill is an ingenious contrivance for grinding oyster shells, and is deserving of merit.
1300. S. L. Wilson, Philadelphia, French bur cob crusher and grinding mill, ... Diploma.
1300. S. L. Wilson, cob crusher and grinding mill, ... Diploma.
1301. The Foos Manufacturing Company, Springfield, Ohio, scientific grinding mill, ... Diploma.
1300. Samuel Goodwin, Philadelphia, cider mills, meritorious.
1301. W. H. Hart, Philadelphia, cider mills, meritorious.
1301. J. E. Horstick, Harrisburg, Pennsylvania, power cider mills, ... Diploma.
1302. John Laughlin, York, Pennsylvania, feed cutter, . . Report.
A. W. Stevens & Son, 408, South Eutaw street, Baltimore, Maryland, ... Diploma.
1302. Y. C. Freed & Co., Royersford, Pennsylvania, feed cutting box, ... Diploma.
1305. E. W. Coffin, Ashland, New Jersey, milk cooler, . . Diploma.

Your committee appointed to judge in class 58, beg leave to report that although the entries were light, they represented many articles of much merit, and we have awarded impartially.

D. H. BRANSON,
JAMES R. PIPER,
Committee.

CLASS 70.

Engines.

1647. The Ide Automatic engine, manufactured and exhibited by the foundry and machine department, Harrisburg Car Manufacturing Company, Harrisburg, Pennsylvania, which was in operation during the continuance of the fair, attracted universal attention on account of its quiet running, compact and pleasing design, superior workmanship, finish, and extraordinary close regulation of speed under varying load and steam pressure. The engine being self-contained, required very little of a foundation and was necessarily erected at small expense, which is permissible alone on account of this construction. A powerful engine, remarkable for its supreme simplicity, and ease of management, controlled by an automatic governor.

1652. Huber Manufacturing Company, Marion, Ohio. The only one of its kind on exhibition; powerful, apparently easily handled and well adapted for the purpose for which it is intended, ... Diploma.
1656. Huber Manufacturing Company, steam engine governor, practical and easily operated, ... Report.
1661. A. H. Edgerton, Philadelphia, vapor engine. A new and novel device of apparently great possibilities.
1661. S. L. Wilson, Philadelphia, Acme automatic oil steam engine, ... Diploma.
1661. S. L. Wilson, Philadelphia, Acme automatic oil steam engine, ... Diploma.
1668. A. Blaker, Newtown, Pennsylvania, tread power, . . Diploma.
1668. Y. C. Freed & Company, Royersburg, Pennsylvania, grain thresher and cleaner, ... Diploma.
1668. Y. C. Freed & Company, Royersburg, Pennsylvania, tread power, ... Diploma.
1674. American Road Machine Company, Kennett Square, Pennsylvania, road scraper, ... Diploma.
1674. Kennet Wagon Company, Kennet Square, Pennsylvania, road scraper, ... Diploma.
1720. Barry & Orton Company, Philadelphia, best collection wood working machines. Fair display.
1739. W. P. Walters & Sons, Philadelphia, square hole boring machine. An invention of unusual excellence, plain, strong, practical; easily operated, and capable of wide range of work.

CLASS 75.

1754. Wilson Mitchel, Philadelphia, grindstones, convenient and practical.
1779. W. J. Adams & Company, Philadelphia, wire weaving machine, a very simple and practical machine for the purpose intended.

J. D. KIRKPATRICK,
Chairman.

CLASS 72.

In the main building one of the most useful and attractive exhibits, is that of A. L Jones, 628 Race street, Philadelphia, and is not only a credit to the exhibitor, but also to the society, and is deserving of especial mention. This display consists of nearly all the most recent improved appliances in the market for raising water, among which are the steam "Jet Simpson Pump," the "Perkins Cistern Pumps," in great variety. In fact this collection is one of the most useful exhibits on the grounds and is worth a diploma.

D. H. BRANSON,
Committee.

GROUP XXIV.—Printing, Telegraph and Electric Lighting.

CLASSES 80, 81, 82 and 83.

1878. H. C. Cooper & Co , Philadelphia, Hall's type-writer, . Report.
1884. F. Z. McQuire, Philadelphia, Mimeograph, ... Report.
Would recommend diploma.

CLASS 81.

1902.	Lewis Lamborn, Philadelphia, electric alarm, ...	Report.
1910.	T. W. Kolbe & Son, Philadelphia, surgical instruments,	Report.
1934.	T. H. Meier, Philadelphia, improved bake oven, . . .	Report.

Would recommend diploma. A very meritorious exhibit.

1933. Cole Manufacturing Company, drug and coffee mills, report best exhibit, is worthy of diploma, and would so recommend.

Mr. PRESIDENT AND GENTLEMEN: Your committee appointed to judge in classes 80, 81, 82 and 83, beg leave to state that very few entries were made in either class, but the entries were exceptionally good, and we have made and recommended awards accordingly.

D. H. BRANSON,
WM. H. HOLSTEIN,
Committee.

DEPARTMENT V.—Fibrous Products.

CLASS 86.

Apparel.

1955. Brainerd & Armstrong, Philadelphia, sewing silk, . Diploma.

This firm exhibit an immense spool having upon it over 900 spools, ordinary size sewing silk, measuring 265 miles in length. They also exhibit spools having on them silk thread adapted to all the various uses to which silk thread is applied. They offer a most beautifully decorated China tea set as a special premium for the best embroidery work done with their rope silk. Their display is evidence of the highest degree of enterprise, ingenuity, energy and taste utilized in the manufacture of sewing silk, and entitles them to the confidence and patronage of the public.

1995. John M. Taylor, Philadelphia, fast black hosiery, . . Diploma.

Mr. Taylor has accomplished a desideratum in giving to the public a black stocking, with the dye so impregnated as to be absolutely indissoluble and not destructive of the fibre of the material composing the stocking. The merits of these stockings are preëminent, and will undoubtedly secure patronage.

1998. Charles E. Frank, Philadelphia, silk and felt hats. A beautiful display of fine silk hats, also the hides of four red foxes, stuffed, presenting a most life-like appearance.

2001. Miss E. Levey, Philadelphia, fans, best collection. The finest fans on exhibition.

2006. G. Daniel, Philadelphia, fine dress shirts, flannel shirts, colored shirts, colored collars and cuffs, shirt bosoms of all kinds, ... Diploma.

Mr. Daniel has subjected to such common sense rules as to enable him to manufacture his products at minimum cost, by the utmost division of labor in all his operations, thereby securing the larger amount of mental and physical force on each point, and by compensating each operative liberally, and in proportion to the value of the products, and using in his operations materials of substantial quality. Unlike most manufacturers, he seeks buyers for all his products among the consumers of our country, giving to them the profit which middlemen would otherwise pocket.

2022. Jno. Hartman, Philadelphia, blue point crackers, very good exhibition.

2027. W. L. & M. Brown, Philadelphia, confectionery, good display.
2028. Geo. Heppe, confectionery made on the grounds, . . Diploma.

Mr. Heppe exhibits a very varied and extensive assortment of candies and fruit at four places on the grounds, and is entitled to great credit for his display.

GEO. RHEY,
Committee.

GROUP XXVIII—Skins, Dressed and Tanned.

CLASS 89.

2030. Chas. E. Frank, Jr., Philadelphia, furs and sleigh robes, best collection, most beautiful and useful, ... Diploma.
2032. Samson Manufacturing Company, Philadelphia, liquid glue, certainly unsurpassed in its capacity to repair breaks in wood, stone, earthenware, leather, paper, etc., ... Diploma.

CLASS 90.

Saddles, Harness, Etc.

2040. P. S. Frick, Philadelphia, saddles, best collection, . . Diploma.

Mr. Fricks display of all description of goods in the utilization of the horse under saddle, or in harness, is large, varied and of excellent quality, a diploma.

2046 Miss E. Levey, Philadelphia, fancy leather goods. A beautiful display and unexcelled in quality, ... Diploma.

CLASS 92, 93 and 94.

Soaps and Perfumery.

2072. Cambridge & Son, floral extracts, good exhibition.
2072. Arthur Frick, Philadelphia, perfumery, fine exhibit worthy of special note, ... Diploma.
2072. Bean Vale Bros. & Co., Philadelphia, perfumery, creditable display.
W. J. Pechin, kosmo cream, ... Diploma.
2072. C. I. Baker & Co., Philadelphia, perfumery and face powder, display of perfumery and face powder arranged in fine taste and in great variety.
2075. Bean Vale Bros. & Co., Philadelphia, ideal tooth powder, ... Diploma.
2076. C. I. Baker & Co., Philadelphia, clover leaf face powder, Diploma.
2074. Walter Sellers, Camden, N. J., Pearline washing powder, ... Diploma.
2086. John Lucas, varnishes, dry colors, ... Diploma.
2087. George D. Weatherill & Co., Philadelphia, white lead, Diploma.
2088. George D. Weatherill & Co., colored paints, ready mixed, ... Diploma.
2088. John Lucas, colored paint, excellent exhibition.
2106. W. R. Warner & Co., pharmaceutical goods, creditable display

Having examined the exhibits entered in classes, we make the foregoing awards.

JOEL HERR,
Committee.

CLASS 95.

Furniture.

2115. Tabor Skinner, Philadelphia, extension table, a patent work worthy of notice, ... Diploma.
2124. Ridgeway Refrigator Company, refrigators, very complete, ... Diploma.
2125. Ridgeway Refrigator Company, folding beds, ... Diploma.
2125. Geo. T. Connor & Co., Boston, Mass., sofa beds, . . . Diploma.
2132. Connecticut Plating Company, electro-plated ware (copper bottom), ... Diploma.

Wm. Taylor,
Committee.

CLASS 99.

Household Machines.

2050, 1 and 2. Wheeler & Wilson Manufacturing Company, sewing machines and button hole machines, the finest exhibit, the display of this firm deserves the highest commendation having in the main building a number of their machines run by power and in their own building a most excellent display, also in the ladies' department of the work, etc., ... Diploma.
2154. Jacob Erb, Philadelphia, washing machine, with dog power. for best labor saving machine, ... Diploma.
A. E. Warden, Philadelphia, special mention, weight power.
2155. Thos. Holden & Son, wringer, report. Good quality construction durable.
2061. Thos. Holden & Son, mangle, ... Diploma.
2064. Henlock & Newton, Philadelphia, self wringing mop, Diploma.
2065. Union Machine Works, meat chopper, ... Diploma.
2068. M. Kase & Co., Philadelphia, washboard, for everlasting washboard and finest display of washboards, . . Diploma.

Your committee respectfully submit the foregoing as their report of class 99. The display of Wheeler & Wilson, is very fine and deserves great praise. We also mention that the competition of washing machines and angles on exhibition are very fine, and would be very difficult to decide upon.

S. F. Barber,
B. P. Thompson,
H. S. Reinhold,
Committee.

CLASS 100.

Warming Apparatus.

2170. Leibrandt and McDowell Stove Company, Philadelphia, ornamental grates, ... Diploma.
2172. West Point Manufacturing Company, West Point, Pennsylvania, hot water radiator, ... Diploma.
2074. Star Steam Heating Company, Mt. Joy, Pennsylvania, steam heat boiler, ... Diploma.
2176. Thomas Robertson and Stevenson Company, Philadelphia, parlor stoves, ... Report

Leibrandt, McDowell & Co., parlor stoves, for double heater with drums, ... Diploma.

2177. Pennsylvania Gas Globe Light Company, parlor gas stove, ... Special mention.

H. W. Willis, Philadelphia, parlor gas stove, ... Diploma.

2178. H. W. Willis, Philadelphia, oil stove, ... Diploma.

2179. Leibrandt and McDowell Stove Company, portable heater, ... Diploma.

George F. Goodley, portable heater, ... Diploma.

2183. Artistic Mantel Company, wood mantels, ... Diploma.
Elegant display.

CLASS 101.

Culinary Appliances.

2186. Leibrandt and McDowell Stove Company, kitchen ranges, ... Report.
Victor cook ranges with hot water reservoir, fine display.

Thomas Robertson and Stevenson Company, cooking range with gauze wire doors, ... Diploma.
With horizontal boilers an excellent display cooking ranges, each provided with gauze wire doors, a recent improvement; cooking and baking ranges were in operation worthy of diploma

2189. L. S. Gay, Champion cooker, . . Favorable mention, diploma.

2190. Pennsylvania Gas Globe Light Company, gas cooking stove, ... Report.

H. A. Willis, Philadelphia, gas cooking stove, ... Report.

2191. H. A. Willis, Philadelphia, oil cooking stove, ... Report.

2192. Conrow Bros. & Co., tinware for culinary purposes, . Diploma.

2193. Conrow Bros & Co., enamel iron ware, ... Diploma.

2194. Ridgway Refrigerator Company, improved fruit jars, Report.
Patent tops keep fruit pressed below liquor.

2195. William McNall, Philadelphia, meat roaster, ... Diploma.

2196. Philadelphia Ornamental Wire Company, household wire goods, ... Report.

Large display of useful household articles, ... Diploma.

CLASS 103.

Artificial Illumination.

2210. Pennsylvania Gas Globe Light Company, gas machine, Report.
Old established machine; its merits will speak for it.

2212. A. J. Weidner, Philadelphia, lamps and fixtures, splendid exhibit; for Gladstone electric lamp, ... Diploma.

Pennsylvania Gas Globe Light Company, gas lamps or lanterns; apparatus in working condition on grounds, ... Report.

Ridgway Refrigerator Company, street lamps, double reflector street and station, ... Report.

2213. Ridgway Refrigerator Company, hand lanterns, . . . Report.

D. W. Bard, Camden, New Jersey, hand lanterns, . . Report.

The foregoing is a report of your committee after making a careful examination of the exhibits, some of which were very attractive, especially those of A. J. Weidner, Thomas Robertson, Stevenson & Co., and Leibrandt and McDowell Stove Company.

H. S. REINHOLD,
B. P. THOMPSON,
W. B. TILL,
Committee.

CLASSES 104, 106 and 107.

Buildings, Fencings, Enclosures and Roads.

2220. D. M. Ellis, Philadelphia, wood and iron fence for garden, best iron fence, ... Report.
A light and substantial iron fence, costing little money to construct.
2225. Edward Sutton, Philadelphia, ornamental gates and post, ... Diploma.
2233. Hassenford Safe Company, Philadelphia, fire and burglar proof safes, handsome display, ... Diploma.
2237. C. W. & H. Middleton, Philadelphia, wire lathing, . Diploma.
2237. Hicks & Dickey, Philadelphia, wire fence, ... Diploma.
2237. Edward Sutton, Philadelphia, wire fence, ... Diploma.
2041. Trinidad Asphalt Block Company, Asphalt paving block, ... Diploma.
2241. Portland Paving Company, metallic paving block, . . Diploma.
2242. Whilldin Pottery Company, Philadelphia, flower pots, fine display, ... Diploma.
2243. Samuel Schmitz, Philadelphia, rustic work for gardens, large exhibit of useful and ornamental articles. . . Diploma.
2255. A. H. Peterson, Philadelphia, water filters, water filter and cooler combined, ... Diploma.
The filters for dwellings give most satisfactory service, one a filter and cooler combined, being in use in Floral Hall during the fair, where its utility was appreciated by the visitors.
2259. A. H. Peterson, Philadelphia, pressure filter for dwellings . . . . Diploma.

The above is the report of your committee on classes 104, 105 and 106.

H. S. REINHOLD,
B. P. THOMPSON,
W. B. TILL.

CLASS 108.

Educational Means and Incentives.

2277. Mellar Magee Company, Philadelphia, patent back blank book, a very valuable improvement in binding, ... Diploma.
Mellar Magee Company, patent back blank book, . . Diploma.
2283. Ripka & Co., Philadelphia, drawing implements, very beautiful and serviceable collection, ... Diploma.
2291. James Green, case birds, ... Diploma.
Mr. Green exhibits three large cases filled with stuffed birds, and small animals, so closely resembling each animal and bird in life, as to require the observer to scrutinize them closely to realize they are only artificial.

2300. Wherewithall Manufacturing Company, Philadelphia, portfolio book, ... Diploma.

George W. Townsend, of Philadelphia, the author, of the Wherewithall educational system, claims the possibility of multiplying the mental force or power of the people of the United States, almost indefinitely by putting into general and practical use the system of education. If this can be done, all the achievements of this wonderful nation in science, fine arts, mechanics, and in productions from the soil, mines and factories of our country may be increased beyond computation. Mr. Townsend's ideas have received the approval of many eminent men, his system should receive a critical, candid and most thorough examination of the nation without any delay.

2301. Ripka & Co., artists' materials, a serviceable and beautiful display.

2302. F. A. Drake. Fountain pen, Stylographic pen, and gold pens, ... Diploma.

Mr. Drake's display was large varied, noticeable and of the best quality.

CLASS 109.

2313. M. Zineman & Bro., Philadelphia, optical goods, . . Diploma.

M. Zineman & Bro., display the largest quantity and variety of optical goods of great beauty, fine finish, and eminent utility on exhibition. Their Diamanta spectacles and eye glasses are very highly prized by those having defective eyes.

2213. S. Ludin, Philadelphia, optical goods, eye glasses only, Diploma.

On patent eye glasses, Professor Ludin & Co., exhibit a collection of eye glasses and the crystal rock from which the glasses are made, clear as water. The eye glasses are fastened to the nose of the wearer by a new and ingenious device, which without pinching causes them to adhere most tenaciously to the nose, and the glasses are very valuable and comfortable to aids to defective eyes, they also exhibit a contrivance by which they can adjust glasses for each eye, a very desirable result, ... Diploma.

2338. H. C. Randolph, Philadelphia, turning in vegetable ivory, very creditable displayed, ... Diploma.

G. RHEY,
Committee.

CLASS 112.

Instruments of Music.

2361. Schomaker Piano Companv, pianos, eleven pianos, exhibited, grand upright and square, goldstring piano noted for good construction and finish.

2371. M. Scherzer, Philadelphia, pianos, display of Behning pianos in upright cases, in various woods.

2361. M. S. Ludwig, largest display of four well known makes, the Chase piano, being of beautiful and durable construction with brass brace for hammers claiming that makes them more lasting.

2361. Ivers & Pond Piano Company, beautiful action and finish with improved continuous music rack and adjustable soft pedal, fine tone, and well made with double veneering. Story & Clark Organ, Chicago, Illinois. Nickel plated stops, beautiful tone.

2361. Esty, Bruce & Co. Piano, with new action, their own patent. Their organs are widely known for their sweetness of tone and fine construction.

2063. C. J. Heppe, the Stock & Co., exhibit among others a Baby Grand Piano, fine tone, good action, having a sustaining pedal, which is found only on two other makes. Smith Organ Company, excellent representation of pipe organ, can be used for the home. Æolian organ for roller music or fingerboard use, the stops giving the former expression.

2363. W. G. Fischer. Mason & Hamlin organ have a world wide reputation for their durability. The Ducker Piano is a first-class well made piano, with good quality of tone. The Mason & Hamlin Piano have the improved method of stringing with four corner pins claiming the tuner can do better work with them.

2367. Henry Gautchi & Sons, music boxes. Henry Gautchi & Sons have the finest display of music boxes, the only exhibit of the kind here Recommended by the committee for first premium.

2361. Wm. D. Dutton & Co., Hardman Piano. Unapproachable in sweetness of tone, power and durability, contains their new iron patent key support and harp stop, and endorsed by leading professors and others by testimonials. Recommended by the committee of judges for first medal.

The committee find it difficult to judge in this class owing to the general excellence of the exhibit.

LEWIS F. SMITH, Phœnixville, Pa.,
JAMES R. PIPER,
MARY I. STILLE, West Chester, Pa.,
WALTER SOLLERS, Camden, N. J.

CLASS 113.

Implements for Out Door Sports.

2370. The Hart Cycle Company, Philadelphia, velocipede. . Diploma. The company has made an exceedingly creditable display in all their entries. The safety bicycle and folding tricycle are prominent among the newest inventions exhibited. The various attachments and new devices added to their former display make their exhibit worthy of special merit.

The foregoing report is made after examination, and respectfully submitted.

J. A. HERR, *Committee.*

CLASS 122.

Unclassified.

2634. Ransom & Plummer, Philadelphia, step ladder chair, diploma, or bronze medal if the exhibitor so desires. A very ingenious device and a useful article in any house.

2635. Ransom & Plummer, rotary adjustable folding top table, diploma, or bronze medal if committee so desire. A table admirably adapted to sewing room, for cutting garments, or in parlor for an easel for engravings.

2637. J. M. Murray & Co., Philadelphia, Ceylon tea and coffee. This is a specialty and of fine flavor, . . . Diploma.

2640. Isaiah Price, Philadelphia, alarm and call. This alarm has no battery; works with strings connected to a bell by clockwork.

2641. American Novelty Company, Philadelphin, braid shoes, scarfs, satchels, etc., ... Diploma.

All of this work is braded manilla, very beautifully done, and the display a fine one; the shoes and satchels particularly fine.

2638. Protective Manufacturing Company, Philadelphia, fire extinguisher, ... Diploma.

The machines are different from others I have seen (various sizes), they throw a stream of liquid which coming in contact with heat eliminates a gas, which is death to flame A small tube called the Monitor, very useful in a house.

2643. Alfred Butz, Philadelphia, cork, corks and cork working. The machine is adapted to making or finishing the corks after punching; very good work.

2644. R. H. Plummer, Philadelphia, campaign novelties, very creditable display, ... Diploma.

2644. Peter D. Krider, Philadelphia, campaign novelties; very creditable display.

2644. Flag Manufacturing Company, Philadelphia, campaign novelties; very creditable display.

2644. G. B. Sole, campaign novelties; very creditable display.

2644. Puston L. Smith, Philadelphia, campaign novelties; very creditable display.

2645. Pennsylvania State College, Pa.; exhibit of work of pupils, ... Diploma.

Very beautiful display and of the highest order of merit, showing what is practically done by the numerous students at this highly prosperous seat of learning.

2647. Charles T. Bewley, Doylestown, Pa., bath tub apparatus; the apparatus is very good, not particularly adapted to city houses; too cumbersome, ... Diploma.

2549. W. S. Grove, Philadelphia, show cases, ... Diploma.

This show case is by far the most perfect affair of the kind shown; very beautiful too in workmanship, the plan gives much more room than is usual in such cases.

2648. Clement & Dunbar, Philadelphia, cedar ware, ... Diploma.

The display of every description of cedar ware the finest ever shown here.

2650. C. H. Rich, Woolrich Centre, Pa., axle lubricator, . . Diploma.

Is indispensable to any parties owning wheeled vehicles, cheap, safe, always ready, prevents wheels loosening, easy of attachment and clean, no jack or wrenches necessary.

2651. G. A. Schwarz. Philadelphia, toys and fancy goods, . Diploma.

Every variety of toy represented, and very beautiful they are, and well displayed.

2652. A. McWilliamson, Philadelphia, rubber cushioned wheel, ... Diploma.
A wheel which relieves the wheel from jarring, particularly adapted to invalids and for physicians who ride very much.
2655. Charles Trimmuling, Philadelphia, donkey party game; good display of the article.
2656. J. H. Johnson, Philadelphia, umbrella stands, ... Diploma.
These articles are of enameled sheet iron, and hand painted quite elaborately, and make a useful article in the house.
2657. O'Donnel & Harper, Philadelphia, ash sifter; a very useful invention, saves the coal, eliminates the ashes and no apparent dust, ... Diploma.
2658. W. J. Ray & Bro., clothes bar; a very serviceable article, can be used with only one bar out, or eight, . Diploma.
2662. Walcott & Dean, combined step ladder; very convenient wash tub stand, ironing table and ladder.
2663. D. W. Bard. Camden, N. J., carpet tack tool, very convenient in carpet laying.
2667 & 2266. F. G Ford, Philadelphia, patent milk strainer and hook and socket, ... Diploma.
These strainers are of a good pattern, three or four different appliances can be made from a combination of all the parts.
2661. W. S. Reigel, Philadelphia, polishing powder; gives a beautiful polish.
2679. Richard Binder, Philadelphia, hair tonic and goods; a fine display of both articles, ... Diploma.
2672. John H. Palmer, Philadelphia, patent cigar case, very ingenious, holds three or four cigars safely; when empty the affair collapses and takes up no more room than a card case.
2673. C. A. Weisgerber, Philadelphia, patent baby chair, a combination chair, high, low or rocking, nothing to get out of order.
2681. Gordon Food Company, horse, cattle and poultry food, ... Diploma.
2675. Craig's Golden Tonic Company, Craig's Golden Tonic, . Diploma.
Tonic well recommended, special attention called to the beautiful display in connection.
2676. Silas Land, Philadelphia, lightning eraser. . . . . . Diploma.
Removes all grease spots, applicable to all kind of material.
2678. A. H. Peterson, patent bottle stopper, ... Diploma.
A good arrangement for stopper, simple and effectual.
O. S. Bunnell, 720 Chestnut street, Philadelphia, barkine ware, ... Diploma.

The undersigned, appointed to examine the exhibits herein entered, respectfully report that they have examined the said exhibits, and recommend the bronze medals and diplomas herein set forth.

H. B. Buehler,
David H. Branson,
Committee

AWARDS IN LADIES' DEPARTMENT.

CLASS 114.—Fine Arts, &c.

Best oil painting, Miss Adeline Paris, Philadelphia, first premium,	$5 00
Best oil painting, Miss Kate Neilson, Philadelphia, second premium,	2 50
Best landscape in oil, Mrs. B. R. Lamb, Mt. Holly, New Jersey, second premium,	1 50
Best landscape in oil, Annie S. Kirby, Germantown, first premium,	3 00
Best painting of flowers in oil, Essic H. Hensell, Philadelphia, first premium,	3 00
Best painting of flowers in oil, Mrs. J. D. Zook, West Philadelphia, second premium,	1 50
Best painting in water color, Sallie C. Kirby, Germantown, first premium,	5 00
Best painting in water color, Adaline L. Shaw, Philadelphia, second premium,	2 50

Studies from Nature.

Best oil painting and design, Miss Sophie T. Dutton, second premium,	2 50
Best oil painting and design, Mrs. William Dolter, Philadelphia, first premium,	5 00
Best painting in water color, Addie L. Shaw, Philadelphia, first premium,	5 00
Best painting in water color, Mrs. John Bardsley, Philadelphia, second premium,	2 50
Best painting in oil, original design, Frederick Linton, Philadelphia, second premium,	1 50
Best painting in oil, original design, Miss Annie L. Brown, Tioga, first premium,	3 00
Best painting in water color, original design, L. C. Hansell, Philadelphia, first premium,	3 00
Best painting in water color, original design, Mary Ellwell, Philadelphia, second premium,	1 50
Best painting in satin, Mrs. H. H. Day, Philadelphia, first premium,	2 00
Best painting in satin, Miss Helen G. Perinchief, Mt. Holly, New Jersey, second premium,	1 00
Best painting on silk, Mrs. J. Bardsell, Philadelphia, first premium,	2 00
Best painting on silk, Minnie Woerner, Philadelphia, second premium,	1 00
Best painting on velvet or plush, Mrs. Theodore P. Stoy, Merchantville, New Jersey, first premium,	$2 00
Best Kensington painting, Miss Helen G. Perinchief, Philadelphia, first premium,	1 00
Best Kensington painting, Minnie Woerner, Philadelphia, second premium,	50
Best lustre painting, Eleanor Rapp, Norristown, Pennsylvania, first premium,	2 00

Best lustre painting, Mrs. J. Pharro, Mt. Holly, New Jersey, second premium,	$1 00
Best painting on wood, Miss Viola Namkerson, Mt. Holly, second premium,	1 50
Best water color, Addie L. Shaw, Philadelphia, first premium,	3 00
Best painting on brass, Miss Viola Nankinson, Mt. Holly, second premium,	2 00
Best crayon drawing, original design, L. C. Hansell, Philadelphia, first premium,	3 00
Best crayon drawing, copy, Miss J. D. Zook, West Philadelphia, first premium,	2 00
Best crayon drawing, copy, A. J. Brophy, Monroe Station, Pennsylvania, second premium,	1 00
Best pencil drawing, original design, Mrs. S. R. Baugh, Philadelphia, first premium,	2 00
Best pencil drawing, original design, Mrs. L. Nace, Philadelphia, second premium,	1 00
Best pen and ink drawing, original design, Miss Annie S. Brown, Tioga, first premium,	2 00
Best pen and ink drawing, original design, Miss Helen Parinchief, Mt. Holly, New Jersey, second premium,	1 00
Special premium, dye painting, Miss I. M. Smith, Norristown, Pennsylvania, first premium,	2 00
Special premium, dye painting, Miss I. M. Smith, Norristown, Pennsylvania, first premium,	1 00
Special premium, dye painting, Miss I. M. Smith, Norristown, Pennsylvania, first premium,	1 00
Special premium, dye painting, Miss I. M. Smith, Norristown, Pennsylvania, first premium,	2 00
Special Ripka's premium, tapestry, Kate Delberg.	

J. B. Wood,
E. C. Hollinger,
Mrs. W. N. Brunner,
Committee.

Best pair knitted slippers in wool, Gertrude L. Payne, Roxboro', Philadelphia, first premium,	$2 00
Best pair knitted slippers in wool, Amy V. Larkin, Toughkenamon, Pennsylvania, second premium,	1 00
Best pair of crochetted slippers in wool, Miss E. A. George, first premium,	2 00
Best lamp mat in zephyr or crewel, Mrs. A. Markley, Philadelphia, first premium,	1 00
Best lamp mat in zephyr or crewel, E. Williams, Philadelphia, first premium,	2 00
Best display of crochetted lace in Saxony wool or split zephyr, not less than one-eighth yard in each piece, Miss L. A. Wyllie, Mt. Holly, New Jersey, first premium,	2 00
Best display knitted lace in Saxony wool or split zephyr, not less than one eighth yard in each piece, H. S. Closterman, Philadelphia, second premium,	1 00
Best display knitted lace in Saxony wool or split zephyr, not less than one-eighth yard in each piece, Miss L. A. Wyllie, Mt. Holly, New Jersey, first premium,	2 00

Best silk patchwork bed quilt, Mrs. L. A. Moyer, Frankfort, Philadelphia, first premium,	$2 00
Best silk patchwork bed quilt, Isaac Grey, Philadelphia, second premium,	1 00
Best silk crazy work, bed quilt, Mrs. D. P. Ringle, Germantown, first premium,	2 00
Best silk crazy work, bed quilt, M. A. Doron, Mt. Holly, New Jersey, second premium,	1 00
Best velvet or plush bed quilt, J. H. Hulse, Frankfort, first premium,	2 00
Best fancy bed cover, any design, L. I. Heebner, Norristown, Pennsylvania, second premium,	1 00
Best fancy bed cover, any design, W. H. Smith, Philadelphia, first premium,	2 00
Best woolen bed quilt, Catharine Borland, Tioga, second premium,	1 00
Best woolen bed quilt, Annie Russell, first premium,	2 00
Best sofa cover, Mary Craff, Philadelphia, first premium,	2 00
Best sofa cover, Mrs. Rachael O. Kerr, Mt. Holly, second premium,	1 00
Best cotton quilt, Mrs. C. E. Klenn, Tioga, second premium,	1 00
Best cotton quilt, Mrs. Anna Howell, Camden, first premium,	2 00
Best crochetted bed spread, Mrs. Mille Hamilton, Philadelphia, first premium,	2 00
Best crochetted bed spread, Sarah L. Moon, first premium,	2 00
Best fancy pillow sham, any design, Mrs. Rosa M. Yustus, Philadelphia, second premium,	1 00
Best fancy pillow sham, any design, Mrs. Harry Wisham, Philadelphia, first premium,	2 00
Best rug, any design, Mrs. E. W. Broadnox, Bristol, Pennsylvania, second premium,	1 00
Best rug, any design, Miss Emily Broadnox, Bristol, Pennsylvania, first premium,	2 00
Best display of knitted lace edging, Mrs. Ella Climencon, Honeybrook, Pennsylvania, first premium,	2 00
Best pair crochetted slippers in wool, Annie C. Tolnell, Columbia, New Jersey, second premium,	1 00

A. E. RUTHERFORD,
ADA B. DAVIS,
Committee.

CLASS 117.—Plain Needlework, Cotton, Embroidery, Braiding Applique and Beadwork.

Best article of plain needle word, Miss Eliza Looser, Philadelphia, first premium,	$1 00
Best article of plain needle work, Miss Lizzie Maison, Cheyney, Pennsylvania, second premium,	50
Best article of plain needle work, Martha B. Lodge,	1 00
Best article of plain needle work, L. Irene Heebner, Philadelphia, second premium,	50
Best display of button holes, Miss Lizzie Maison, Cheyney, Pennsylvania, first premium,	2 00
Best display of button holes, Mrs. E. K. Maris, Philadelphia, second premium,	1 00

Best article darning, Mrs. W. W. Esbin, West Chester, Pennsylvania, second premium,	$0 50
Best article darning, Mrs. Bodine, Pemberton, New Jersey, first premium,	1 00
Best article patching, Mrs. W. W. Esbin, West Chester, first premium	1 00
Best painting on brass, Cornelia B. Davis, Philadelphia, first premium,	2 00

CLASS 115.—Miscellaneous.

Best painted tile, Kate C. Neilson, Philadelphia, first premium,	3 00
Best painted tile, B. R. Lamb, Mt. Holly, New Jersey, second premium,	2 00
Best display on china or porcelain, thirteen pieces, in porcelain colors, Mrs. Theodore F. Stoy, Merchantville, first premium,	4 00
Best display on china or porcelain, thirteen pieces, in porcelain colors, William F. Day, Philadelphia, second premium,	1 00
Best painting on china or porcelain, in porcelain colors, Kate C. Neilson, first premium,	2 00
Best painting on shell, Mrs. R. Lamb, Mt. Holly, New Jersey, first premium,	2 00
Best painting on shell, Frank Linton, Philadelphia, second premium,	1 00
Best painting on slate, Miss Viola Nankinson, Mt. Holly, first premium,	2 00
Best painting on slate, Mrs. J. E. Pharro, Mt. Holly, second premium,	1 00
Best article of painting on pottery, William F. Day, Philadelphia, first premium,	2 00
Best article of painting on pottery, Miss Viola Nankinson, Mt. Holly, second premium,	1 00
Best article on bone carbon, Mrs. S. F. Haines, Vincentown, New Jersey, second premium,	1 00
Best article of modeling in clay, Miss Sophia T. Dutton, Philadelphia, first premium,	2 00
Best article of modeling in clay, Mrs. William Dixon, Philadelphia, second premium,	1 00
Best wax work, any design, Mrs. John Bardsley, Philadelphia, first premium,	2 00
Best articles in English tissue paper work, any design, Miss Lillie Kester, Coronton, first premium,	1 00
Best article repousse work, in brass, Mrs. Theodore F. Stoy, Merchantville, first premium,	2 00
Best article repousse work, in brass, W. W. Glenn,	2 00
Best article repousse, in brass, work, Miss Annie Schober, Philadelphia, second premium,	1 00
Best article repousse work, in brass, W. W. Glenn,	2 00
Best article hair work, Linda B. Rogers, Philadelphia, first premium,	2 00
Best article etching on linen in indelible ink, Miss E. Spachman, West Chester, Pennsylvania, first premium,	2 00

Best article etching on linen in indelible ink, Mrs. F. J. West, Philadelphia, second premium,	$1 00
Best display of penmanship by amateurs, Mrs. J. Perinchief, Philadelphia, first premium,	2 00
Special premium, Mrs. S. E. Faugh. first premium,	2 00
Special premium, Kate Clement, Philadelphia, first premium,	2 00
Special premium, Miss Mamie Gardella, Philadelphia, second premium,	50

IDA M. HARTMAN,
ELEANOR RAPP,
FLORA D. HACKMAN,
Committee.

CLASS 116.—Zephyr Work, Bed Quilt, &c.

Best sofa afghan, in wool, Mrs. B. R. Lamb, Mt. Holly, first premium,	$2 00
Best sofa afghan, in wool, Mrs. William Coulston, Philadelphia, second premium,	1 00
Best afghan for child's couch, in wool, Mrs. L. A. Wyllie, Mt. Holly, first premium,	2 00
Best display of zephyr work, greatest variety of stitches, Mrs. A. Schmidtt, Philadelphia, second premium,	1 00
Best article of tufted zephyr work, L. H. Rogers, Philadelphia, second premium,	1 00
Best article of tufted zephyr work, Mrs. O. L. Dudley, Hartford. New Jersey, first premium,	2 00
Best article on gobelin work, Mrs. M. E. Williams, Philadelphia, first premium,	2 00
Best footrest, in wool, any design, E. D. Haydrick, Chestnut Hill, first premium,	2 00
Best footrest, in wool, any design, Mary E. Williams, Philadelphia, second premium,	1 00
Best sofa cushion, on canvas, Annie Russell, Philadelphia, first premium,	2 00
Best pair slippers, on canvas entire, Mrs. A. R. Markely, Philadelphia, second premium,	1 00
Best pair of slippers on canvas entire, Miss R. S. Bodine, Pemberton, New Jersey, second premium,	50
Best display of cotton embroidery three articles, Miss Ellen Barroll, Elkton, Maryland, first premium,	2 00
Best display of cotton embroidery, three articles, Amelia Frugoni, Philadelphia, second premium,	1 00
Best display of cotton embroidery, three articles, any design, Mrs. John Black, Mt. Holly, New Jersey, second premium,	50
Best display of cotton embroidery, three articles, any design, Mrs. Kate J. Williams, West Philadelphia, first premium,	1 00
Best article embroidery on linen momie cloth, Helen Horing, Philadelphia, second premium,	50
Best article embroidery on linen momie cloth, Miss K. J. Williams, first premium,	1 00
Best pair towels, satin stitch embroidery, Mrs. J. C. Black, Mt. Holly, New Jersey, second premium,	50
Best pair towels, satin stitch embroidery, Mrs. W. M. Lynn, Mt. Holly, New Jersey, first premium,	1 00

Best pair towels, cross stitch, Mrs. R. S. Bodine, Pemberton, New Jersey, first premium,	$1 00
Best pair towels, cross stitch, Cornelia Davis, second premium,	50
Best pair towels, outline embroidery, Mrs. Samuel Coles, Ellisburg, Pennsylvania, second premium.	50
Best pair towels, outline embroidery, Miss K. J. Williams, West Philadelphia, first premium,	1 00
Best article braided work, any design, Mrs. O. L. Dudley, Hartford, New Jersey, second premium,	50
Best article braided work, any design, Miss R. S. Bodine, Pemberton, New Jersey, first premium.	1 00
Best article applique work, any design, Mrs. Wm. G. Brunner, Philadelphia, first premium,	1 00
Best article applique work, any design, Mrs. B. R. Lamb, second premium,	50
Best article of drawn thread work, L. Y. Underdown, Philadelphia, first premium,	1 00
Best article of drawn thread work, Mrs. L. B. Shooner, Philadelphia, second premium,	50
Best article of bead work, any design, Gertrude L. Paine, first premium,	1 00
Best article of bead work, any design, Miss Kate J. Williams, West Philadelphia, second premium,	50
Best display of needle work, plain, three articles, Mrs. R. Kitchen, Millville, Pennsylvania, second premium,	1 00
Best display of needle work, plain, three articles, Miss R. S. Bodine, Pemberton, New Jersey, first premium,	2 00

MARY D. WHITEHEAD.
MRS. B. J. WOODWARD,
SALLIE J. BERR,
Committee.

CLASS 118.

Crochetted and Knitted Work Netting, Etc.

Best display, knitted lace edging, not less than one-eighth yard in each piece, Anna Risdon, Mt. Holly, New Jersey, first premium,	2 00
Best display knitted lace edging, not less than one-eighth yard in each piece, Mrs. R. Kitchen, Millville, Pennsylvania, second premium,	1 00
Best crochetted cape, Miss H. C. Perinchief, Mt. Holly, New Jersey, first premium,	1 00
Best crochetted cape, Mary J. Barnes, Philadelphia, second premium,	50
Best display of crochetted work, greatest variety of design, Mrs. B. Lamb, first premium,	2 00
Best display of crochetted work, greatest variety of design, M. A. Gottchdt, Philadelphia, second premium,	1 00
Best crochetted shawl, Miss B. M. George, first premium,	1 00
Best crochetted skirt, Lydia B. Rogers, first premium,	1 00
Best crochetted skirt, Miss Jennie Roberts, Norristown, Pennsylvania, second premium,	50
Best crochetted nubia or fascinator, Mrs. R. R. Lamb, second premium,	50

Best crochetted nubia or fascinator, Mary E. Williams, Philadelphia, first premium,	$1 00
Best crochetted nubia or fascinator, Mrs. Samuel Coles, Ellisburg, first premium,	1 00
Best crochetted hood, Mrs. J. E. Pharro, first premium,	1 00
Best crochetted leggins, M. E. Williams, Philadelphia, first premium,	1 00
Best pair crochetted mittens, Miss E. H. George, Philadelphia, second premium,	50
Best pair crochetted mittens, Lizzie Maicon, Cheyney, Pennsylvania, second premium,	50
Best crochetted purse, Z. Amy Larkin, second premium,	50
Best crochetted purse, Miss K. J. Williams, first premium,	1 00
Best display of articles, crochetted for infants' wear, Miss E. A. George, second premium,	1 00
Best display of articles, crochetted for infants' wear, Amelia Frugoni, Philadelphia, first premium,	2 00
Best display crochetted lace or edging, not less than one-eighth yard in each piece, Abbie Folwell, second premium,	1 00
Best display crochetted lace or edging, not less than one-eighth yard in each piece, Mrs. M. A. Rorer, Frankfort, first premium,	2 00
Best display crochetted lace or edging, not less than one-eighth yard in each piece, Maggie Wiegner, Philadelphia, second premium,	50
Best display of crochetted work with fancy braid, not less than one-eighth yard in each piece, Amelia Frugoni, Philadelphia, first premium,	2 00
Best display of crochetted work with fancy braid, not less than one-eighth yard in each piece, Miss Anna Barry, Philadelphia, second premium,	50
Best display of crochetted work with fancy braid, not less than one-eighth yard in each piece, Maggie Wiegner, Philadelphia, first premium,	1 00
Best display of chrochetted work with fancy braid, not less than one-eighth yard in each piece, Abbie E. Folwell, second premium,	1 00
Best display fancy knitting, greatest variety of design, J. M. Smith, first premium,	2 00
Best shawl, knitted, Mrs. B. R. Lamb, first premium,	1 00
Best pair knitted silk stockings, Florence Brook, Philadelphia, first premium,	1 00
Best pair fancy knitted silk stockings, Mrs. R. Kitchin, Millville, Pennsylvania, first premium,	1 00
Best pair plain knitted cotton stockings, Mrs. C. Frugonia, Philadelphia, first premium,	1 00
Best pair plain knitted cotton stockings, Mrs W. W. Esbin, West Chester, Pennsylvania, second premium,	50
Best pair woolen knitted stockings, Mrs. C. A. Kitchin, Millville, first premium,	1 00
Best pair woolen knitted stockings, Mrs. C. A. Kitchin, Millville, first premium,	1 00
Best pair knitted silk socks, Florence Brook, Philadelphia, first premium,	1 00

Best pair knitted wool socks, Florence Brook, Philadelphia, second premium,	$0 50
Best pair knitted wool socks, Mrs. J. F. Lawmaster, Mt. Holly, N. J., first premium,	1 00
Best pair knitted silk mittens, Miss Sadie Townsend, Norristown, first premium,	1 00
Best pair knitted silk mittens, Miss Lizzie Brown, Pemberton, N. J., second premium,	50
Best display for knitted articles for infants' wear, Z. Amy Larkin, Toughkenamon, Pennsylvania, first premium,	2 00
Best display of knitted articles for infants' wear, Miss Maria Frugoni, Philadelphia, second premium,	1 00
Best lady's knitted skirt, Mrs. I. M. Anthony, second premium,	1 00
Best lady's knitted skirt, Mrs. B. R. Lamb, second premium,	50
Best article rick-rack work, Mrs. J. Pharro, first premium,	1 00
Best article rick-rack work, Mrs. H. G. Lippincott, second premium,	50
Special Mrs. R. Kitchin, first premium,	75
Special Mrs. Rose Yustus, first premium,	1 00
Special Flo. Brooks, first premium, Philadelphia,	1 00
Special Amelia Frugoni, Philadelphia, first premium,	1 00

MISS BLANCH B. LEVIS,
MISS MARY B. RUTHERFORD,
MISS EMMA L. SHANER,
Committee.

CLASS 119.—Silk Embroidery, Crewell and Ornamental Needlework.

Best display of silk embroidery, Mary E. Williams, first premium,	$3 00
Best display of silk embroidery, Mary E. Williams, second premium,	2 00
Best embroidered article on satin, I. N. Smith, Norristown, Pennsylvania, first premium,	2 00
Best embroidered article on satin, Nellie Wilson, Philadelphia, second premium,	1 00
Best silk embroidery on linen, Mrs. Ellie C. McKnight,	2 00
Mrs. Charles Roth, second premium,	1 00
Amelia Frugoni, first premium,	3 00
Mrs. J. E. Parus, first premium,	2 00
Mrs. John Black, second premium,	2 00
Mrs. Annie Russell, second premium,	1 00
Mrs. L. B. Shooner, first premium,	2 00
Best embroidered foot rest, any design, Mrs. G. C. McKnight, Trenton, New Jersey, first premium,	2 00
Best embroidered foot rest, any design, Miss Blanch B. Levis, second premium,	1 00
Best embroidered sofa pillow, Mrs. H. C. Markley, Philadelphia, second premium,	1 00
Best embroidered sofa pillow, Jennie S. Davis, Norristown, Pennsylvania, first premium,	2 00
Best embroidered silk table cover, Miss A. Sargent, Philadelphia, second premium,	1 00

Best embroidered stand cover, Mrs. Allan M. Walker, Tioga street, Philadelphia, first premium,	$2 00
Best embroidered stand cover, Kate J. Williams, second premium,	1 00
Best silk embroidered lab robe for child, Mrs. A. Doron, first premium,	2 00
Best silk embroidered lap robe for child, Miss Minita Roth, Hoyt, Pennsylvania, second premium,	1 00
Best embroidered piano scarf, any design, Miss E. O. McKnight, Trenton, New Jersey, first premium,	2 00
Best embroidered piano scarf, any design, Mrs. H. M. Day, Philadelphia, second premium,	1 00
Best fancy table scarf, Mrs. J. E. Pharro, Mt. Holly, New Jersey, second premium,	1 00
Best fancy table scarf, O. L. Einwecker, Philadelphia, first premium,	2 00
Best fancy table cover, Kate J. Williams, second premium,	1 00
Best fancy table cover, Mrs. H. M. Day, Philadelphia, first premium,	2 00
Best fancy mantel lambrequin, Mrs. A. Doron, Mt. Holly, first premium,	2 00
Best fancy mantel lambrequin, Blanch B. Levis, Philadelphia, second premium,	1 00
Best fancy bracket lambrequin, Mrs. B. R. Lamb, Mt. Holly, New Jersey, first premium,	1 00
Best fancy bracket lambrequin, Mrs. W. W. Lynn, Mt. Holly, New Jersey, second premium,	50
Best table cover embroidered in worsted, Mrs. E. E. Bean, Philadelphia, first premium,	2 00
Best table cover embroidered in worsted, Mrs. R. H. Lamb, Mt. Holly, New Jersey, second premium,	1 00
Best stand cover embroidered in worsted, Mrs. Allan M. Walker, Philadelphia, first premium,	2 00
Best stand cover embroidered in worsted, Mary E. Williams, Philadelphia, second premium,	1 00
Best lap robe for child, embroidered, any design, Annie Russell, second premium,	1 00
Best display of crewel and embroidery, three pieces, Mrs. W. W. Lynn, Mt. Holly, New Jersey, second premium,	2 00
Best display of crewel and embroidery, three pieces, Mrs. Allen M. Walker, Philadelphia, first premium,	3 00
Best article of crewel embroidery, any design, Miss L. Brown, Pemberton, New Jersey, second premium,	1 00
Best article of crewel embroidery, any design, Mrs. Allan M. Walker, Philadelphia, first premium,	2 00
Best article embroidery in Hamburg wool, Kate J. Williams, Philadelphia, first premium,	2 00
Best article in embroidery on velvet, Mrs. A. Doron, Mt. Holly, first premium,	2 00
Best article embroidery on plush, Harriet A. Heydrick, Chestnut Hill, first premium,	2 00
Best article embroidery on plush, Laura V. Jones, second premium,	1 00
Best article of embroidery, with gold thread, Z. Amy Larkin, Toughkenamon, Pennsylvania, second premium,	1 00

Best article of embroidery with gold thread, Mrs. E. C. McKnight, Trenton, New Jersey, first premium,	$2 00
Best article Oriental embroidery, Mrs. H. M. Day, Philadelphia, first premium,	2 00
Best article Oriental embroidery, Miss Annie Risden, second premium,	1 00
Best article tinsel embroidery, Miss Ella C. McKnight, Trenton, New Jersey, second premium,	1 00
Best article tinsel embroidery, Minnie Shoemaker, Philadelphia, first premium,	2 00
Best article of applique embroidery, Mary E. Williams, second premium,	1 00
Best article of applique embroidery, Mrs. R. B. Lamb, Mt. Holly. New Jersey, first premium,	2 00
Best display arasene embroidery, Mrs. W. G. Bruner, Philadelphia, first premium,	2 00
Best article arasene embroidery, any design, Minnie Shoemaker, Philadelphia, second premium,	1 00
Best article chenille embroidery, Mrs. E. A. Darnell, Mt. Holly, N. J., first premium,	2 00
Best article chenille embroidery, Mrs. Wm. Deckson, first premium,	2 00
Best article chenille embroidery, Mrs. Katie Basso, Philadelphia, second premium,	2 00
Best article fancy chenille work, Mary E. Williams, Philadelphia, second premium,	1 00
Best article raised embroidery filoselle, Wheeler & Wilson Manufacturing Company, Philadelphia, first premium,	2 00
Best article raised embroidery filoselle, Minne W. Shoemaker, Philadelphia, second premium,	1 00
Best fancy table scarf, Wheeler & Wilson, first preminm,	2 00
Best fancy table cover, Wheeler & Wilson, first premium,	2 00
Best fancy mantel lambrequin, Wheeler & Wilson, first premium,	3 00
Best display of crewel embroidery, three pieces, Wheeler & Wilson, first premium,	3 00
Best article embroidery on plush, Wheeler & Wilson, first premium,	2 00
Best article tinsel embroidery, Wheeler & Wilson, first premium,	2 00
Best display arasene embroidery, three pieces, Mrs. Mary Cheadle, Holmesburg, Pa., second premium,	2 00
Best display arasene embroidery, Wheeler & Wilson, first premium,	3 00
Best article arasene embroidery and design, Wheeler & Wilson, first premium,	2 00
Best article fancy chenille work, H. S. Klosterman, Philadelphia, first premium,	2 00
Best display outline embroidery, three pieces, Mrs. George Heydrick, Chestnut Hill, first premium,	3 00
Best display outline embroidery, three pieces, Mrs. George Heydrick, Chestnut Hill, second premium,	2 00
Best sideboard cloth, any design, Wheeler & Wilson, first premium,	2 00

Best bureau scarf, any design, Wheeler & Wilson, first premium,	$2 00
Special premium, Miss Maria Frugoni, Philadelphia,	2 00
Special premium, Mamie Gardella, Philadelphia,	2 00
Special premium, Miss Anna Russell, Philadelphia,	2 00
Special premium, Miss Anna Russell, second premium,	1 00
Special premium, Miss Kate Sailor, Philadelphia, first premium,	2 00

MRS. CHAUNCY DARLINGTON,
MRS. W. P. CONOVER,
MISS EMILY D. JOHN,
Committee.

CLASS 120.

Lace and Fancy Miscellaneous Work.

Best article lace work, Miss Elizabeth Fite, Philadelphia, first premium,	$2 00
Best article lace work, Martha B. Lodge, Cheyney, first premium,	2 00
Best article lace work, Miss Sadie Townsend, Norristown, Pa., first premium,	2 00
Best article lace work, Kate J. Williams, Philadelphia, first premium,	1 00
Best article lace work, Julia C. Gilbert, Philadelphia, first premium,	2 00
Best article lace work, Julia C. Gilbert, second premium,	1 00
Best article lace work, Mrs. L. A. Wyllie, Mt. Holly, N. J., second premium,	1 00
Best article lace work, J. F. Lowmaster, Mt. Holly, N. J., first premium,	2 00
Best article Briton lace, darned net, H. G. Lippincott, Salem, N. J., first premium,	2 00
Special premium, Mrs. C. D. Bitters, Salem, N. J., second premium,	1 00
Best outline embroidery in silk, Mrs. Samuel Ciles, Ellisburg, second premium,	2 00
Best outline embroidery in silk, Miss Abbie Evans, Cinnaminson, N. J., first premium,	3 00
Best display outline embroidery in cotton or linen, Mrs. S. F. Coles, Ellisburg, first premium,	3 00
Best display outline embroidery in cotton or linen, Mrs. S. F. Coles, Ellisburg, second premium,	2 00
Best sideboard cloth, Helen Herring, Philadelphia, first premium,	2 00
Best sideboard cloth, Helen Herring, Philadelphia, second premium,	1 00
Best waiter towel, any design, Mrs. Sarah Coles, Ellisburg, N. J., second premium,	75
Best waiter towel, any design, Gertrude L. Payne, Roxboro' first premium,	1 50
Best tidy embroidery, any design, Mrs. H. M. Day, Philadelphia, second premium,	50
Best chair scarf, any design, Mrs. James Dillworth, second premium,	50

Best chair scarf, any design, Mrs. E. C. McKnight, Trenton, New Jersey, first premium, ...	$1 00
Best fancy window curtain, any design, Miss Elsie Vandyke, first premium, ...	2 00
Special, Mrs. Cornelia Maison, Philadelphia, first premium,	2 00
Special, Mrs. Charles Funk, Philadelphia, first premium, . .	2 00
Special, Mrs. Kitchen, Millville, Pennsylvania, first premium,	2 00
Special, Mrs. Humphry Thomas, Philadelphia, first premium,	2 00
Special, M. A. Gottshdt, Philadelphia, first premium, . . .	2 00
Special. Mrs. C. Guilbert, Philadelphia, first premium, . . .	2 00

Miss LIZZIE MAISON,
Miss SADIE TOWNSEND,
Miss MARY C. McKEE,
Committee.

CLASS 121.

Work Made and Entered by Children Under Fourteen Years of Age.

Best article of plain sewing by hand, Miss Gertie Roberts, first premium, ...	$1 00
Best article of plain sewing by hand, Bessie Dillworth, Centreville, Delaware, second premium, ...	50
Best article patch-work, any design, Bessie Dillworth, Centreville, Delaware, second premium, ...	50
Best article patch-work, any design, Mary Kinsler, first premium, ...	1 00
Best article of silk crazy-work, Nettie Herring, first premium, ...	1 00
Best article of silk crazy-work, Stella Wilson, Philadelphia, second premium, ...	50
Best article of crochetted-work, Stella Wilson, first premium,	1 00
Best article in lace on Saxony wool, Sallie W. George, Philadelphia, first premium, ...	1 00
Best article of zephyr-work, Ninna J. Barlow, first premium,	1 00
Best painting in oil, Bessie Dillworth, Centreville, Delaware, second premium, ...	50
Best crayon drawing, Lizzie Grestey, Philadelphia, first premium, ...	1 00
Best pencil drawing, Sarah W. George, Philadelphia, second premium, ...	50
Best specimen of penmanship, Cora W. Esbin, West Chester, second premium, ...	50
Best dressed doll, Gertrude Roberts, first premium, . .	1 00
Best article of outline embroidery, Clara M. Esbin, West Chester, first premium, ...	1 00
Best article of outline embroidery, Laura E. Priest, West Chester, second premium, ...	50
Best article of silk embroidery, Nettie Herring, Philadelphia, first premium, ...	1 00
Best article of crewel embroidery, Bertha Heim, Philadelphia, first premium, ...	1 00
Best article of darning, Cora M. Esbin, West Chester, second premium, ...	50
Best article of patching, Cora M. Esbin, West Chester, second premium, ...	50

Best fancy pin cushion, any design, Minnie W. Shoemaker, Philadelphia, second premium,	$0 50
Best tidy in crochette, Jessie Esbin, West Chester, first premium,	1 00
Best tidy any other design, Jessie Esbin, West Chester, second premium,	50
Best article tissue paper-work, Nina G. Barlow, first premium,	1 00
Special, Elsie W. Dettra, Chestnut Hill, Pennsylvania, first premium,	1 00
Special, Cora M. Esbin, West Chester, second premium,	50
Special, Cora M. Esbin, West Chester, second premium,	50
Special, Jessie M. Esbin, West Chester, second premium,	50
Best painting in oil, William F. Day, first premium,	3 00
Special, Cornelia B. Davis, second premium,	1 00
Best bureau scarf, any design, Mrs. H. M. Day, Philadelphia, second premium,	1 00
Best bureau scarf, any design, Mrs. A. Doron, Mt. Holly, New Jersey, first premium,	2 00
Best fancy toilet set, any design, Miss Allen M. Walker, Philadelphia, first premium,	2 00
Best banner, any design, Mrs. J. E. Pharro, Mt. Holly, New Jersey, second premium,	1 00
Best banner, any design, Mrs. S. H. Wright, Norristown, Pennsylvania, first premium,	2 00
Best scene, any design, Miss E. E. McKnight, Trenton, New Jersey, second premium,	1 00
Best scene, any design, Miss Annie A. Risdon, Mt. Holly, New Jersey, first premium,	2 00
Best embroideried lamp mat, Z. Amy Larkin, Toughkenamon, Pennsylvania, second premium,	50
Best embroideried lamp mat, Mary E. Williams, Philadelphia, first premium,	1 00
Best wall pocket, Mary E. Williams, first premium,	1 00
Best table mats, any design, Kate J. Williams, Philadelphia, first premium,	1 00
Best table mats, any design, Mrs. B. R. Lamb, Philadelphia, first premium,	1 00
Best table mats, any design, Mrs. E. A. Darnell, Mt. Holly, New Jersey, second premium,	50
Best pair vase mats, any design, Miss Allen M. Walker, Philadelphia, second premium,	50
Best shaving case, Miss Helen G. Perinchief, Philadelphia, first premium,	1 00
Best shaving case, Mrs. E. A. Darnell, Mt. Holly, New Jersey, second premium,	50
Best working bag or reticule, any design, Miss Annie A. Risdon, Mt. Holly, New Jersey, first premium,	1 50
Best working bag or reticule, any design, Mrs. Allen M. Walker, second premium,	75
Best waste paper basket, any design, Mrs. M. L. Tettes, Philadelphia, first premium,	1 00
Best waste paper basket, any design, Mrs. B. R. Lamb, Philadelphia, second premium,	50

Best work basket, any design, Mrs. E. A. Darnell, Mt. Holly, New Jersey, first premium,	$1 00
Best brush holder, any design, Miss Ida Johnson, second premium,	50
Best brush holder, any design, Miss H. G. Perinchief, first premium,	1 00
Best shoe pocket, any design, Gertrude L. Payne, Philadelphia, first premium,	1 00
Best tea-pot holder, any design, Mrs. John Black, Philadelphia, second premium,	50
Best tea pot holder, any design, H. G. Lippincott, Salem, New Jersey, first premium,	75
Best dust holder, Mrs. E. A. Darnell, Mt. Holly, New Jersey, first premium,	1 00
Best fancy D'oyle in silk, Helen Herring, Philadelphia, first premium,	1 00
Best fancy D'oyle in silk, Mrs. John Black, Philadelphia, second premium,	50
Best article crochetted in seine twine, Mrs. M. L. Tettis, Philadelphia, first premium,	1 00
Best tidy crochetted, any design, Mrs. Harry Wisham, Philaphia, second premium,	50
Best tidy crochetted, any design, Miss E. A. George, Philadelphia, first premium,	1 00
Best tidy embroideried, any design, Mrs. Allan M. Walker, Philadelphia, first premium,	1 00

Mrs. Taylor Brinton,
Mrs. Cora Targett,
Estelle Woodward,
Committee.

REPORT

OF THE

State Horticultural Association of Pennsylvania,

FOR 1888.

CONSTITUTION.

ARTICLE 1. This society shall be entitled, "The State Horticultural Association of Pennsylvania," and its object shall be the advancement of the science of horticulture and pomology.

ARTICE 2. Any person may become a member of this Society by a vote of a majority of the members present, at any meeting, and by paying into the treasury the sum of one dollar annually; or the payment of one dollar to the treasurer, at any time, shall constitute membership, and entitle said member to a copy of the proceedings. The payment of ten dollars, at one time, will constitute life membership.

ARTICLE 3. Its officers shall consist of a President, three Vice Presidents, a Recording and Corresponding Secretary and a Treasurer, all of whom shall be elected annually by ballot.

ARTICLE 4. The following committees shall be appointed: A Committee of five on Nomenclature; a Committee of three on Insects of whom the professor of entomology shall be chairman; an Executive Committee, consisting of the elective officers of this association and three of whom, including the president, shall constitute a quorum; and a General Fruit Committee consisting of one member from each county represented, with a general chairman of the whole, each member of the fruit committee to have the privilege of appointing two assistants.

ARTICLE 5. The Society may, at any time, elect honorary members.

ARTICLE 6. The Society may, from time to time, appoint professors on Entomology, Botany, Horticultural Chemistry and Geology.

ARTICLE 7. This constitution may be altered or amended by a vote of two-thirds of the members present, at any regular meeting, notice of the proposed amendment, in writing, having been previously given.

ARTICLE 8. Seven members shall constitute a quorum for the transaction of business.

BY-LAWS.

ARTICLE 1. The Committee on Nomenclature shall collate and decide the standard and synonymous names of all fruits known in the Society, with the authorities for each, and report, so far as practicable, at each regular meeting, and record the same in a book kept for that purpose.

ARTICLE 2. The General Fruit Committee shall carefully and thoroughly investigate the subject of fruit culture in general. Each local committee of three shall collect such useful and interesting information in relation to the subject as may be in their power, and embody the same in monthly reports, to be made to the general chairman; such reports to be by him examined and embodied in his annual and semi-annual reports. Also that the said county committee shall form *ad interim* committees for their respective counties; and further, that said *ad interim* committees are hereby authorized to publish the reports in the "*Gardener's Monthly*," or such other paper as they may select, the same having been first submitted to the chairman of the General Fruit Committee for his approval: *Provided*, That said publication shall be free of expense to the Association.

ARTICLE 3. The annual meeting of the Association shall be held on the third Wednesday of January of each year, at such a place as the Executive Committee may appoint, at which time the election for officers shall take place; said officers to serve from the close of the meeting at which they are elected to the close of the succeeding annual meeting, at which an exhibition and discussion of fruits shall take place, and other business transacted in the following order:

1st. Reading of minutes of previous meetings.
2d. Roll call and dues collected.
3d. Election of officers.
4th. Reports of officers.
5th. Reports of standing committees.
6th. Reports of special committees.
7th. Unfinished business of former meeting.
8th. New business.

The nomination and election of new members shall be in order at any time during the session.

ARTICLE 4. Other meetings may be convened by the Executive Committee at such time and place as they may appoint.

ARTICLE 5. No member who is in arrears for dues shall be eligible for any office, or serve on any standing committee; and any member who shall neglect to pay his dues shall cease to enjoy the privileges of membership.

ARTICLE 6. A library shall be established for the benefit of the members of this Association, and a Librarian elected annually with other elective officers.

Section 1. The Librarian shall keep an alphabetical record of the books, etc., and may loan to any member of this Association any books contained therein without cost: *Provided*, That it be returned within three months, and in as good condition as when received.

Section 2. Any member refusing to return to the Librarian books or reports from said library, shall pay their equivalent, or forfeit his membership.

LIST OF OFFICERS FOR 1888.

PRESIDENT.

CALVIN COOPER, Bird-in-Hand.

VICE PRESIDENTS.

JOSIAH HOOPES, West Chester.
H. M. ENGLE, Marietta.
EDWIN SATTERTHWAIT, Jenkintown.

RECORDING SECRETARY.

E. B. ENGLE, Waynesboro'.

CORRESPONDING SECRETARY.

W. P. BRINTON, Christiana.

TREASURER.

J. HIBBERD BARTRAM, Milltown.

LIBRARIAN.

THOMAS J. EDGE, Harrisburg.

PROFESSOR OF BOTANY.

THOMAS MEEHAN, Germantown.

PROFESSOR OF ENTOMOLOGY.

S. S. RATHVON, Lancaster.

PROFESSOR OF HORTCULTURAL CHEMISTRY.

S. B. HEIGES, Camp Hill.

COMMITTEES FOR 1838.

GENERAL FRUIT COMMITTEE.

CYRUS T. FOX, *Chairman*, Reading, Berks county, Pa.

COUNTY.	MEMBERS.	P. O. ADDRESS.
Adams,	J. L. Sherfy,	Gettysburg.
Allegheny,	E. P. Swift,	Mount Oliver.
Armstrong,	J. Donaldson,	Kittanning.
Beaver,	A. L. McKibbin,	Green Garden.
Bedford,	J. Z. Replogle,	New Enterprise.
Berks,	C. T. Fox,	Reading.
Blair,	F. Jackel,	Hollidaysburg.
Bradford,	R. M. Wells,	Towanda.
Bucks,	Henry W. Comfort,	Falsington.
Butler,	J. W. Phillips,	Zelienople.
Carbon,	E. Bauer,	East Mauch Chunk
Cambria,	G. W. Harvey,	Gallitzin.
Clarion,	J. H. Patrick,	Clarion.
Centre,	Prof. W. A. Buckhout,	State College.
Chester,	J. W. Pyle,	Willow Dale.
Clearfield,	Samuel Hall,	McGee's Mills.
Clinton,	Joel A. Herr,	Cedar Springs.
Columbia,	J. K. Sharpless,	Catawissa.
Crawford,	James Turner,	Meadville.
Cumberland,	H. S. Rupp,	Shiremanstown.
Dauphin,	Gabriel Hiester,	Harrisburg.
Delaware,	J. Lewis, Jr.,	Newtown Square.
Elk,	W. H. Johnston,	Benezett.
Erie,	G. A. Evans,	West Mill Creek.
Fayette,	Samuel Wakefield,	Red Lion.
Franklin,	Dr. B. L. Ryder,	Chambersburg.
Fulton,	B. C. Dawney,	Hustontown.
Greene,	L. W. Gwynn,	Carmichaels.
Huntingdon,	G. W. Owens,	Birmingham.
Indiana,	J. P. Stuchul,	Indiana.
Jefferson,	S. H. Whitehill,	Brookville.
Juniata,	J. E. Jamison,	McAlisterville.
Lackawanna,	I. F. Tillinghast,	LaPlume.
Lancaster,	L. S. Reist,	Oregon.
Lawrence,	Samuel McCreary,	Neshannock Falls.
Lebanon,	Henry C. Snavely,	Lebanon.
Lehigh,	H. Leh,	Allentown.
Luzerne,	P. Sutton,	Exeter.
Lycoming,	A. R Sprout,	Picture Rocks.
McKean,	A. J. Hughes,	Port Allegheny.
Mercer,	W. H. McKean,	Mercer.
Mifflin,	Henry Ort,	Lewistown.
Monroe,	R. F. Schwartz,	Analomink.
Montgomery,	E. Satterthwait,	Jenkintown.
Montour,	W. M. Gearhart,	Danville.
Northampton,	A. S. Shimer,	Redington.
Northumberland,	William Voris,	Pottsgrove.
Perry,	M. B. Eshleman,	Newport.
Philadelphia,	T. B. Meehan,	Germantown.
Potter,	A. B. Mann,	Coudersport.
Schuylkill,	Thomas Hoy,	Orwigsburg.
Snyder,	J. F. Boyer,	Mt. Pleasant Mills.
Somerset,	C. C. Musselman,	Somerset.
Sullivan,	E. A. Strong,	Dushore.
Susquehanna,	Myron Kasson,	Montrose.
Tioga,	S. M. Baker,	Brookfield.
Union,	A. S. Sheller,	Lewisburg.
Venango,	J. Miller,	Franklin.
Warren,	W. Cowan,	Warren.
Washington,	Pressley Leech,	Burgettstown.
Wayne,	N. T. Underwood,	Lake Como.
Westmoreland,	A. Ruth,	Scottdale.
Wyoming,	N. A. McKown,	Tunkhannock.
York,	Peter Lint,	York.

COMMITTEES FOR 1883.

Committee on Nomenclature.

H. A. Chase, *Chairman*, Philadelphia.
Dr. J. H. Funk, Berks county.
H. W. Fulmer, Allegheny county.
J. T. Smith, Juniata county.
Edwin W. Thomas, Montgomery county.

Committee on Orcharding.

Col. George F. McFarland, *Chairman*, Dauphin county.
J. G. Engle, Lancaster county.
Jacob Heyser, Franklin county.
Edwin Davis, Juniata county.
John Hoffa, Northumberland county.

Committee on Floriculture and Arboriculture.

William H. Moon, *Chairman*, Bucks co.
P. C. Hiller, Lancaster county.
John C. Hepler, Berks county.
George Achelis, Chester county.
John C. Cullen, Northampton county.

Committee on Entomology.

S. S. Rathvon, *Chairman*, Lancaster co.
Ezra High, Berks county.
Herman Strecker, Berks county.

Committee on Arrangement and Reception.

W. M. Pannebaker, *Chairman*, Mifflin co.
Henry Ort, Mifflin county.
J. E. Jamison, Juniata county.
E. B. Engle, Franklin county.

LIFE MEMBERS.

Bartram, J. Hibberd, Milltown, Chester county.
Brinton, W. P. Christiana, Lancaster county.
Calder, Rev. James, Penn Yan, N. Y.
Chase, H. A., 1430 S. Penn Square, Philadelphia.
Cornelius, Robert, Philadelphia.
Engle, J. G., Marietta, Lancaster county.
Engle, H. M., Marietta, Lancaster county.
Engle, E. B. Waynesboro', Franklin co.
Fox, Cyrus T., Reading, Berks county.
Garretson, Joel V., Flora Dale, Adams county.
Hayes, Charles P., 149 North Fifteenth street, Philadelphia.
Heyser, Jacob, Chambersburg, Franklin county.
Hildrup, W. T., Harrisburg, Dauphin county.
Hacker, William, Philadelphia.
Hoopes, Josiah, West Chester, Chester county.
Hiller, Casper, Conestoga, Lancaster county.
Hiller, Peter C., Conestoga, Lancaster county.
Landis, Israel, Lancaster, Lancaster county.
Martin, J. O., Mercersburg, Franklin county.
Pannebaker, William M., Lewistown, Mifflin county.
Reist, Peter S., Lititz, Lancaster county.
Scribner, Prof. F. Lamson, Washington, D. C.
Shaffner, Jacob, Harrisburg, Dauphin county.
Swift, E. P., Mount Oliver, Allegheny county.
Thomas, George B., West Chester, Chester county.
Thomas, Edwin W., King of Prussia, Montgomery county.
Van Deman, H. E., Washington D. C.

HONORARY MEMBERS.

Barry, P., Rochester, N. Y.
Downing, Charles, Newburg, N. Y. (deceased).
Ellwanger, George, Rochester, N. Y.
Garber, J. B., Columbia, Lancaster county, Pa. (deceased).
Meehan, Thomas, Germantown, Pa.
Michener, Dr. E., Toughkenamon, Chester county, Pa. (deceased).
Parsons, S. B., Flushing, N. Y.
Parry, William, Parry, N. J. (deceased).
Rathvon, Prof. S. S., Lancaster.
Rowe, Hon. D. Watson, Chambersburg, Pa.
Rutter, John, West Chester, Pa.
Saunders, William, Washington, D. C.
Stitzel, Hon. George D., Reading, Pa.
Thomas, John J., Union Springs, N. Y.
Warder, Dr. John A., North Bend, Ohio (deceased).
Willets, Rev. Dr., Philadelphia.
Wilder, Hon. M. P., Boston, Mass. (deceased).
Wickersham, Dr. J. P., Lancaster, Pa.

ANNUAL MEMBERS.

Achelis, George, West Chester.
Albright, William B., Reading.
Bachman, T. F., Kreidersville.
Bauer, Elwin, East Mauch Chunk.
Baer, J. C., Hamburg.
Bernhart, Major F. S., Reading.
Bickel, Isaac, Reading.
Biddle, F. C., Chadd's Ford.
Boyer, John F., Mt. Pleasant Mills.
Breneiser, Charles, Reading.
Breinig, John L., Allentown.
Bressler, J. H., Lebanon.
Brinser, E. C., Middletown.
Brossman, Adam B., Robesonia.
Brown, J. Evans, Cranberry, N. C.
Bruckman, George W., Reading.
Brumbaugh, A. J., Reading.
Buchanan, T., Athens.
Bucher, Riley, Lebanon.
Burkey, Joshua R., Reading.
Chase, R. G., Geneva, N. Y.
Chase, H. A., 1430 South Broad st., Phila.
Cheetham, J. H., Reading.
Cocklin, E. H., Bowmansdale.
Comfort, H. W., Fallsingston.
Cooper, Calvin, Bird-in-Hand.
Cullen, John C., South Bethlehem.
Cullen, Peter, Reading.
Curwen, John, Jr., Villa Nova.
Davis, E. M., 205 Walnut Place, Phila.
Davis, Edwin, Thompsontown.
Day, Theodore, Dyberry.
Deppen, G. B., Myerstown.
Dietrich, Levi F., Reading.
Derr, Cyrus G., Reading.
Dougherty, Jere E., Lebanon.
Edge, Thomas J., Harrisburg.
Eppihimer, Henry, Reading.
Ermentrout, Hon. J. N., Reading.
Fegley, Albert H., Reading.
Fisher, J. J., Oil City.
Fisher, W. H., Reading.
Fox, E. S. Reading.
Fulmer, H. W., 508 Smithfield st.. Pitts.
Funk, Dr. J. H., Boyertown.
Greenleaf, Dr. R. P., Henry Clay, Del.
Griesemer, Charles A. Z., Reading.
Groh, Israel, Shafferstown.
Gutshall, Col. John, Carlisle.
Hain, Adam L., Stouchsburg.
Harrison, J. E., Natrona.
Hart, Lane S., Harrisburg.
Hawley, Jesse G., Reading.
Hagenman, Hon. J., Reading.
Hartman, Frederick S., Tuckerton.
Heilman, S. P., Heilmansdale.
Heinley, G. H., Reading.
Heller, F. P., Reading.
Hendel, Henry B., Reading.
Hepler, John C. Reading.

Herr, Joel A., Cedar Springs.
Herr, Daniel D., Lancaster.
Hershey, Jacob H., Rohrerstown.
Hershey, Simon A., Landisville.
Hershey, W. L., Landisville.
Hess, Sam'l R., Ephrata.
Hiester, Gabriel, Harrisburg.
High, Ezra, Reading.
High, William R., Reading.
Hoffer, Isaac, Lebanon.
Holtzman, John S., Tulpehocken.
Hoy, Thomas, Orwigsburg.
Jaekel, F., Hollidaysburg.
Jameson, James, Reading.
Keim, Isaac W., Reading.
Keller, Col. D. C., Reading.
Kendig, M. D., Creswell.
Kenny, James R., Reading.
Kershner, George W., Reading.
Kerstetter, O. S., McKee's Half Falls.
Kindt, S. S., Reading.
King, James P., Bethlehem.
Kline, G. W., Lebanon.
Knabb, Jacob, Reading.
Kready, John, Mount Joy.
Kuser, D. H. G., New Berlinville.
Lantz, C. R., Lebanon.
Leh, H., Allentown.
Leinbach, Joseph A., Reading.
Leinbach, George A., Reading.
Levan, Cyrus, Jacksonwold.
Linn, John, Chambersburg.
Lint, Peter, York.
Linville, J. C., Gap.
Livingood, Frank, Reading.
Long, O. V., East Chester.
Longsdorf, D. E., Mechanicsburg.
McFarland, Col. George F., Harrisburg.
Maltzberger, H., Reading.
Marks, Levi, Reading.
Meehan, Thomas B., Germantown.
Mengel, Levi W., Reading.
Moon, W. H., Morrisville.
Moers, John F., Reading.
Moore, William G., Womelsdorf.
Moser, James K., Allentown.
Moyer, John M., Beckersville.
Murdoch, Alexander, Pittsburgh.
Muhlenburg, H. A., Reading.
Musser, H. C., Shock's Mills.
Neischwander, Levi M., Hamburg.
Nelson, Louis, Lebanon.
Nimson, C. H., Allentown.
Nutting, Lyman, Lebanon.
Oberly, Erwin, Easton.
Obold, John, Reading.
Obold, John H., Reading.
Ort, Henry, Lewistown.
Ort, Mrs. Henry, Lewistown.
Orth, John F., Reading.
Phillips, J. W., Zelienople.
Pyle, J. W., Willow Dale.
Rakestraw, Thomas, Willow Dale.
Ralston, John, Reading.
Reist, Levi S., Oregon.
Reber, Henry C. G., Reading.
Reiger, Henry, Reading.
Rife, Jacob L., West Fairview.
Ritter, W. S., Reading.
Rupp, H. S., Shiremanstown.
Rush, J. G., West Willow.
Rollman, John, Lower Heidelberg.
Ruth, A., Scottdale.
Ryder, Dr. B. L., Chambersburg.
Satterthwait, Edwin, Jenkintown.
Scherer, Reuben W., Manatawny.
Schwarz, R. F., Analomink.
Shearer, Joseph, Reading.
Sharpless, J. K., Catawissa.
Shimer, A. S., Redington.
Shoemaker, R. C., Jarrettown.
Seidel, Franklin, Maiden Creek.
Small, Samuel, Jr., York.
Smith, J. T., McAlisterville.
Smith, J. H., Cocolamus.
Snavely, H. C., Lebanon.
Smith, Dr. Aaron, Reading.
Smith, F. Leaf., Reading.
Snyder, Solomon L., Reading.
Stager, Jonas H. W., Avon.
Strunk, A. S., Reading.
Stauffer, A. K., Reading.
Thomas, Joseph W., King of Prussia.
VanBuskirk, James, Pricetown.
Van Reed, Wellington, Reading.
Walker, Dr. M. M., Germantown.
Wanner, Amos B., Reading.
Wentzel, Aug. L., Reading.
Witmer, Joseph F., Paradise.
Williams, J. Savage, 79 Second street, Baltimore.
Whitner, George K., Reading.
Woods, T. A., Harrisburg.
Wynnings, Roy, Lebanon.
Young, J., Gerhart, Reading.
Zug, Allen W., Lititz.

STATE HORTICULTURAL ASSOCIATION OF PENNSYLVANIA.

Twenty-ninth annual meeting held January 18th and 19th, 1888, in the court house, Lebanon, Pa.

Aside from the very full attendance and great local interest manifested in our meeting at this place it will be remembered by all present as having far excelled all former meetings in the completeness of its floral and horticultural display and the effective and artistic arrangement of the large collection of rare plants and flowers so generally contributed by the citizens of Lebanon and vicinity. To Mr. H. C. Snavely, the resident member of the committee of arrangements; to Mrs. G. Dawson Coleman and Robert H. Coleman, who contributed so liberally and generously from their extensive conservatories and greenhouses; to Mr. Louis Nelson, the experienced and obliging gardener to Mrs. Coleman, for his taste and skill in arranging the exhibits; to Mr. Roy Wynings, the enterprising and artistic florist, for his novel and original floral designs and decorations of American flags; to Hon. C. R. Lantz and the choir under his direction who kindly favored us with several choice selections of vocal music; to the press of Lebanon, for faithful reports of our proceedings, and for valued aid in awakening an interest in our work; to the citizens of Lebanon and vicinity generally, who assisted in making our sojourn pleasant and our meetings a success, we owe a debt of gratitude, and tender our sincere thanks. Full and formal resolutions, expressive of our sentiments, will be found in their proper order in our proceedings. There were several fine displays of fruits and vegetables, but the collections were fewer than on many previous occasions, owing to the shortness and partial failure of the fruit crop in 1887. The following new members were enrolled at Lebanon and since our last annual meeting:

LIFE.

H. A. Chase, 1430 S. Penn Square, Philadelphia.

ANNUAL.

Maj. F. S. Bernhart, Reading.
John F. Boyer, Mt. Pleasant Mills.
J. H. Bressler, Lebanon.
A. J. Brumbaugh, Reading.
A. B. Brossman, Robesonia.
Riley Bucher, Lebanon.
Peter Cullen, Reading.
Theodore Day, Dyberry.
G. B. Deppen, Myerstown.
Jere E. Dougherty, Lebanon.
J. J. Fisher, Oil City.
H. W. Fulmer, Pittsburgh.
Isaac Groh, Shafferstown.
A. L. Hain, Stouchsburg.
Jacob H. Hershey, Rohrerstown.
G. H. Heinly, Reading.
J. E. Harrison, Natrona.
S. P. Heilman, Heilman Dale.
Isaac Hoffer, Lebanon.
Thomas Hoy, Orwigsburg.
G. W. Kline, Lebanon.
C. R. Lantz, Lebanon.
Frank S. Livingood, Reading.
O. V. Long, East Chester.
H. C. Musser, Schock's Mills.
Johnson Miller, Lititz.
Louis Nelson, Lebanon.
Lyman Nutting, Lebanon.
John Obold, Reading.
John H. Obold, Reading.
Saml. R. Hess, Ephrata.
J. H. W. Stager, Avon.
Wellington Van Reed, Reading
Dr. M. M. Walker, Germantown.
A. L. Wentzel, Reading.
Roy Wynings, Lebanon.
J. G. Young, Reading.

THE MEETING.

Promptly at 2 o'clock President Cooper called the meeting to order. Mr. H. C. Snavely, chairman of the committee of arrangements, introduced Mayor Hoffer, who cordially welcomed the members of the association in the following words:

Mr. President and gentlemen: It is hardly necessary to tell you that the people of Lebanon are pleased that you have selected their city for the meeting of your association this year, and in extending to you a hearty welcome, I only announce the general feeling of our people. We are all anxious that you may feel perfectly at home, and may have a pleasant and profitable time while you are with us.

The subject which you have come here to consider is one in which we are all interested. The productions of the horticulturist have become part of the necessaries of every family, and your deliberations will, no doubt, be mutually beneficial to us all. There is one feature in these annual meetings for the promotion of special branches of business which is not generally appreciated at its full importance, and that is the social feature. Man does not live from bread and meat alone, and it is not all of life to study the best means of promoting and improving our business, and to devote all our time and our energies in making the most out of that business. We are social beings that cannot live in isolation. We must have social intercourse, and can only enjoy life in its fullness by the cultivation and development of social relations.

Meetings of the kind you hold here to-day lift us out of the dry-rot of a daily routine life, and out of the little circle of a neighborhood where we are apt to look only towards the center and fancy that we see the whole world. They widen this narrow circle, open up new sources of information and social enjoyment, enlarge and liberalize our views and our feelings, fill us with higher and nobler aspirations, and store our memories with interesting knowledge and pleasant recollections that we can all carry home with us and utilize and enjoy at our pleasure.

Meeting among flowers, and plants, and fruits, as you do here, for the purpose of comparing notes on their character, their cultivation and their improvement, opens up a field of study, of research and of experimental development as extensive as the broad surface of the earth. The hidden powers in the growing plant and the mysteries and laws of life are your very interesting study. The beautiful and useful in nature are the subjects of your investigations and the topics of your discussion, and the mind that is not benefited, not refined, and not elevated in such employment and amidst such surroundings, is dead to everything that is lovely, and good and wonderful in this world of life.

Permit me, in behalf of the people of Lebanon, to thank Mr. Snavely for the labor and trouble he has taken upon himself in getting up this meeting, and let me assure the members of this association that the welcome extended to them is a sincere and not a mere conventional one.

President Cooper responded as follows:

Mr. Mayor: In behalf of the association I thank you for this very cordial welcome. We come among you not as strangers, but to rekindle the bonds of friendship. Our mission is one for the general good, and although you may bind us in chains of steel from one of the greatest deposits of iron in the world, our product enters so largely into your daily use, that we, too, are indispensible. We come not as teachers, but to discuss with your people the successes and difficulties of horticulture, and we invite all to attend and participate in our discussions. We have conceived that by these annual meetings, at various points in the State, we are able to collate as well as cater for all.

This very elaborate display of tropical and other plants, by your generous and liberal-spirited citizen, Mrs. G. Dawson Coleman, is indeed a pleasure and a surprise. We seem to have migrated, in a moment as it were, from the icy blasts of winter to a land of midsummer bloom, and although these plants are familiar to many of us, we did not dream of or anticipate any such display at this season. It so far excels all precedents that I am at a loss for language to express our appreciation. The skill and taste displayed by Wynings and Dace, the enterprising florists of your city, also deserve special mention. The design of the railroad depot and alligator are so beautiful and life-like that a pen description is impossible. To be appreciated they must be seen. These young florists have displayed great taste and ingenuity in their preparation and will undoubtedly become experts in their line.

I, therefore, in behalf of the association, tender our most heartfelt gratitude to the gracious donor, her gardener, his assistants, to Messrs. Wynings and Dace, and to Mr. H. C. Snavely, chairman of the committee of arrangements, for the transformation of this hall of justice to a bower of loveliness, where we can inhale the sweet perfume of hyacinthes, carnations and the sacred lily of the Chinese, and enjoy the beautiful in Nature's gifts.

Again thanking you for the very kind reception, we invite you to remain and take part in our discussions.

On motion of Judge Stitzel, a recess of five minutes was ordered to enable members to pay their annual dues.

President Cooper announced that new members would be received at any time upon payment of the fee of $1, and handing their name and address to the treasurer. All members are entitled to copies of our annual reports as published from time to time.

A short recess having been taken, business was resumed and minutes of last annual meeting read and approved.

The following committee was appointed to nominate candidates for the several officers for the ensuing year:

Josiah Hoopes, chairman, W. H. Moon, H. S. Rupp, H. C. Snavely, Thos. B. Meehan.

SECRETARY'S REPORT.

To the President and Members of the State Horticultural Association of Pennsylvania:

GENTLEMEN: Realizing that brevity is important I will not occupy your valuable time with a lengthy report. As directed by this society at our last annual meeting, promptly after our adjournment, I sent a circular letter to each Congressman from Pennsylvania, with a copy of your resolution regarding the "Hatch Bill." The effect of this circular upon the minds of our national lawmakers may be inferred from the fact that the act passed both Houses before the circulars had reached their destination. As to the advantages we, as horticulturists, may expect to reap from this law, we hope to be fully advised during our present meeting. I am able to report some improvement in the issuing of our annual reports. Two years ago they were not ready until about June 15. The reports for 1886 were ready for delivery about March 25, 1887, while those for 1887 are promised for delivery during the present month. Our reports lose all their freshness and much of their value on account of these delays in publication, but there seems to be no prospect of greater promptness while they are being published by the State.

In obedience to your resolution at our last annual meeting, directing the secretary to prepare blanks and solicit information from fruit growers throughout the State, regarding varieties best adapted to their respective localities, I beg to report that I have accomplished this work to the best of my knowledge and ability, and will submit the result of my endeavors for your consideration. I encountered, at the outset, some difficulty in ascertaining in many counties even the names of parties who would likely feel sufficient interest in this work to respond to my inquiries. By writing to the county commissioners, and by personally interviewing members of the State Legislature from such counties, I succeeded in procuring a number of names and addresses that have been the means of aiding me greatly. To names thus procured, and to members of our society, I mailed some 400 blanks for the required information, including stamped and addressed envelope for reply, and have succeeded in getting back about 200 reports from 65 counties, leaving only two counties unrepresented, Bradford and Delaware. Both of these counties are represented on our General Fruit Committee, and I hope yet to have their reports. Many of the replies received prove that their authors are not only well posted in reference to matters pertaining to fruit growing and horticulture, but evince an interest in the work of our society and a desire to become members thereof. In this direction, if in no other, I am sure the work will be productive of good. It will open new fields and bring us in communication with new friends, who will aid us in our work. Every friend and correspondent thus brought into acquaintance with us will be a missionary and a help in a field hitherto unoccupied. In order to reap the fullest benefits from the work thus begun, this society should devise some plan of organizing local auxiliary societies in every county ot the State. How best to accomplish this is a question worthy our consideration before the present meeting adjourns. I have requested one of our members to offer some suggestions in a brief paper on this subject, which I trust will elicit some discussion.

I cannot close this report without referring to the coöperation and assistance so ably rendered by Mr. Snavely and the press and citizens of Lebanon, and to Mr. Fox, of Reading, for his help by word and pen. Whatever measure of success is achieved by this meeting must be attributed to them. I am happy to report, also, that all the railroads centering and having connection here have met all our requests in a spirit of liberality. I hope the result of our work here will not be a disappointment to our Lebanon friends, and I know we shall go away better and wiser than when we came, and with naught but good will toward all.

Respectfully submitted.

E. B. ENGLE,
Secretary.

The treasurer and chairman General Fruit Committee, stated that they were not yet prepared to submit their reports, but would do so at a subsequent session. Reports of several special committees were also promised for later sessions. Mr. Moon, chairman of Committee on Exhibition, submitted a brief verbal report. A correspondence with the members of his committee elicited the fact that fruit in Pennsylvania was almost a total failure, and we unanimously decided not to attempt an exhibit. I have a letter from Secretary Seiler, of the State Agriculture Society, inviting our association this year to exhibit at their State Fair.

Judge STITZEL. I can endorse what Mr. Moon has reported on this subject. The finest fruit at our State Fair, last year, was from New Jersey. But little was exhibited from Pennsylvania. I would suggest that a committee be appointed and the question of an exhibit be referred to them.

Col. MCFARLAND. I saw a fine display of fruits last autumn at the Berks county fair. Such an exhibit would have done us credit at the State Fair.

Judge STITZEL. It is true we had a fine display at Reading, but fruit generally ripened prematurely and soon depreciated in appearance.

Mr. MOON. I did not expect nor desire that my report would elicit any discussion, and I hope we will proceed with the regular order of business.

The Chair announced the following committee on exhibition for 1888:

W. H. Moon, chairman; George D. Stitzel, Gabriel Hiester, P. C. Hiller, J. Hibbard Bartram.

On motion of Mr. Moon the following committee was appointed to report upon the display and decorations for our place of meeting:

W. H. Moon, chairman; Josiah Hoopes, H. A. Chase, W. P. Brinton.

Mr. Moon asked to be execused from serving on one of the committees just named, but the request was not granted.

Col. George F. McFarland, of Harrisburg, read the following paper on "*Retarding Houses for the Preservation of Fruit.*"

RETARDING HOUSES FOR THE PRESERVATION OF FRUIT.

By Col. GEO. F. MCFARLAND.

Fruit growers in Pennsylvania have no little difficulty to raise good fruit in paying quantities. But they have still greater difficulties to preserve what they do raise, until it can be profitably used or marketed. These difficulties are the greater, because all fruits mature earlier and have more unfavorable weather to contend with after matured in this State, than further north, and hence require more artificial means to retard the ripening process so that it may not destroy them before this profitable marketing season comes. Further north common cellars preserve the fruit till its proper season. Here the same varieties must be rushed into market and used out of season, or go to loss. It thus happens that when fruit crops are abundant, there is a glut, and prices are forced down too low to be remunerative to the grower, and when partial failures come, those who have fruit to spare cannot hold it long enough to get the advantage of the higher prices that follow such partial failures.

From these considerations it will be seen that second in importance only to the best means of raising fruits is the best means of preserving them when raised until profitably marketed as demand requires. And it must be said that poor and slip-shod as has been our modes of raising fruits in Pennsylvania heretofore, our modes and means of preserving and marketing are even worse.

Having a large number of fruit trees, grape vines and small fruits coming into bearing, the profitableness of which will depend mainly on my ability to properly preserve and market, I have been studying the subject from an interested businessman's standpoint, and have therefore sought to be both thorough and practical in my researches.

It is well known that in our latitude decay in all vegetable and animal products is caused and hastened by frequent and great changes in our atmosphere, subjecting these articles to extremes of heat and cold, causing sweats and chills, in air sometimes charged with much moisture and at other times below the freezing point.

Hence, not only fruit growers, who are frequently interested also in butter, eggs, poultry and vegetables, but all producers and dealers in any of these articles, are interested in securing some process for changing these conditions and checking entirely or retarding as much as possible this decay. And the process that will do this most perfectly, at the least cost, and is the best adapted to the needs, means and capacity of the masses of producers scattered through the State, is the process practical men are seeking.

Methods of Producing Cold Storage.

Passing by cellars, caves, air-tight rooms and other make-shifts of limited or local value, I propose to consider the two prominent methods of producing cold storage now practically on trial.

1. Cold storage by the use of ice.
2. Cold storage by means of machinery for cooling the air without the aid of ice.

1. Cold storage by the use of ice. In this State, where ice is usually abundant and can be stored cheaply by many fruit growers, and is universally used for so many other purposes, our preferences would naturally be in favor of cold storage by the use of ice.

Two years ago when in company with members of this association, I visited Stober's fine building in Reading, I felt certain this method, in some form, would prove successful, and I have since studied it closely with strong leanings in its favor. And I am satisfied that with well designed ice houses, well built and thoroughly furnished and managed, fruits can be preserved as long as desired in fair condition. But another difficulty meets us here. The dampness incident to and inseparable from melting ice so affects the fruit that it will not bear shipment and handling when taken out of these storage ice houses. Fruit from the most successful of them is fit only for *immediate* use, while from those less perfect both its flavor and condition are destroyed, and it is no longer natural or palatable.

I have said this dampness is inseparable from melting ice, and I will briefly give the reason.

Steam is defined to be "water in the gaseous form." When condensed it becomes vapor; water gives off this steam or vapor at every temperature. At 32°, when it becomes ice, it gives off steam or vapor exerting a pressure equal to .085 lbs. per square inch. At 80° the pressure become .5 lb. per square inch; at 102° 1 lb.; at 162° 5 lbs.; at 193° 10 lbs., and at 212°, the boiling point, 14.7 lbs., exactly equal to the pressure of the atmosphere.

This steam or vapor which produces the dampness is, as I have shown, given off from ice, and more rapidly and with stronger pressure as it melts, until the air is fully saturated with vapor of the maximum density which the ice, or when melted, the water can give off at the existing temperature. The higher this temperature the more this pressure of dampness. As circulation operates, as it must in ice houses, this dampness is carried off, it is true, but only to be succeeded by fresh air similarly loaded with dampness.

Thus is the fruit subject to this damp atmosphere all the time under the most favorable circumstances, while every imperfection in the surroundings and every change of temperature increases or diminishes the pressure. It is probable that with the temperature as near 32° or freezing as it dare be, and the dampness thus reduced to its minimum, the circulation deemed necessary in ice houses is sufficient to affect the fruit. This is especially probable in view of the fact that in most, if not all ice houses, the damp air coming directly from the melting ice passes to the cold chamber and over the fruit or among the packages containing it.

To be certain that ice will last through a hot summer into fall when cold storage is especially wanted large masses must be put up, requiring houses on a large scale, costing from $5,000 to $8,000. This puts the plan beyond the reach of all but the larger growers and dealers. To this must be added the uncertainty of a sufficient supply of good ice every year.

From these considerations I am forced to conclude that a wise forethought will require fruit growers to look about for some better, more practical, less hazardous and less costly plan of preserving fruits.

2. Cold storage by means of machinery for cooling the air without the aid of ice.

Here, as elsewhere, necessity is the mother of invention, and ice machines and freezing mixtures, both having many uses in commerce and the arts as well as to preserving fruits, have long since engaged the attention of talented scientists and inventors, and not without success. Many of the first inventions are too costly to be practically useful. But J. M. Siebe, of Lambeth, England, succeeded in producing a machine at moderate cost producing ten tons of ice daily and reaching a temperature 20° below zero. Many of his machines are in use in different parts of the world, even nearly under the equator in Peru, where ice had previously never been seen, and in India and at the Cape of Good Hope, in the service of the English government.

Another machine, first shown in the London exhibition of 1862 by the French firm of Carré & Co., is noted for its extreme simplicity, and is said to be adapted to the humblest kitchen, and extensively used in France and England. The price in those countries is said to be from £4 ($20) upward. And as the volatile liquid used is only the aqueous solution of ammonia, the cost of working it is very small. I am seeking further information concerning this and other foreign machines.

But fortunately Americans have not been idle in this direction, and there are now a number of machines being manufactured and used in this country. Among these is the Harrisburg Ice Machine Company's absorption machine on the Carré principal, manufactured at the Harrisburg Car Manufacturing Company, and now in successful operation at the extensive fresh meat establishment of Messrs. C. E. H. Brelsford & Co., in Harrisburg. Through the kindness of Mr. Brelsford, I had the advantages of the fullest examination of his premises, and of his entire experience of several years.

This establishment is adapted not only to the preservation of home fruits and berries, but of fresh meats, poultry, vegetables, butter, eggs and foreign fruits. Its scope is therefore well adapted to the needs of fruit, vegetable and poultry raisers, and dealers in these and in meats, produce and foreign fruits, thus affording opportunity for a coöperation of interested parties in the cities and towns and even villages of Pennsylvania. A description of the building, machinery and process will therefore be of interest to all these classes.

The rooms used for cold storage are in the basement, 56x60 feet, 10-foot story, used as one room, and the first story over it divided into two rooms, 10-foot story, in the one end of a large stone building. The rooms are air-tight, and provided with no ventilation.

The machine and brine tank are on the first floor at the end of the storage rooms, but just outside of them. It is a seven-ton ice machine of the Harrisburg Ice Machine Company's make, which means that if used as an ice-making apparatus it is capable of making seven tons of ice per day of twenty-four hours. The pump forces brine at 10° to 12° temperature from the tank through coils of pipe placed at the ceiling of the storage rooms, because cold air falls. These pipes, varying in diameter from an inch to three inches, are arranged in circulating coils with valves, flow and return, etc., as pipes are in greenhouses heated with water or steam. Salt brine is used because it can be reduced to about 4° above zero without freezing, and because it is cheap.

By this method the air in the room is cooled not by contact with the brine, but with the surface of the pipes made cold by the passage of cold brine through them. The moisture in the air of the room when the operation begins is precipitated as frost on the cold brine pipes as the temperature falls—inch pipes being covered with as much as four inches of ice at times. And as there is no change of air in the room, the same air remaining, no moisture is brought in and the cold air soon becomes dry and remains so. The walls are so dry that a match can be struck on them at any time. The pumps are kept going day and night including Sunday, and this absolute *statu quo* in temperature and degree of moisture is kept up as long as the rooms are in use.

Thus the fruit, berries and other contents of the rooms are kept in a dry unchangeable atmosphere at any desired temperature. It is found that 40° is cold enough to check all action and keep the fruit in exactly the condition it is in when placed under this retarding process. And I had no hesitancy in believing Mr. B.'s statement that lemons kept from June to September, came out in perfect condition, and that berries and fruits of all kind kept from one to six months, were just as fit to ship and market as when placed in the cold storage room. Even ice has been kept with a loss not exceeding five pounds to the ton per month, with the room at 34°.

The cost of Messrs. Brelsford & Co.'s machinery, piping, boiler, pump and fittings complete, with ammonia tank filled, was about $7.000. Capacity, 66,000 cubic feet, some fifty car-loads.

The cost of running day and night, is only about $3.50 per day of twenty-four hours. Larger or smaller machines would cost but little more or less with hired help. But a fruit grower having employés about him could run it for his uses with but little expense beyond the coal. A few barrels of brine and once filling the ammonia tank will run the machinery a whole year. The tank is filled in the first cost of the machine.

One feature much in its favor is that it can be run just to suit the weather. As it gets colder in the fall, and it requires less to keep the temperature at the desired degree, some pipes can be shut off, and the pump need only be run part of the time, during the day, being sufficient frequently.

Another valuable feature is that ice can be manufactured at any time desired, either to the full capacity of the machine, or to such part of this capacity as can be spared after keeping the cold storage room at the desired temperature. It is quite probable that if properly managed, enough can be realized from the sale of ice manufactured the year through, to pay the entire running expenses, thus leaving all the income from storing fruits, etc., as profits. A monthly charge of ten cents per barrel for apples, pears, etc., one-half cent per dozen for eggs, ten cents per crate for berries, would pay a handsome dividend.

From these considerations I fully believe this system of cold storage is well adapted to the needs and means of fruit growers, and is the best now before the public. I will watch its operations during the year and report at the next meeting of your association the results.

Mr. **HILLER**. I have had no experience with "fruit-retarding houses," and have but little to say on the subject. It seems that one important point in the construction of these houses, is to get rid of moisture. I would like to know if moisture is really injurious. So far as my experience goes, I have not found moisture injurious. Some of the finest fruit I have ever seen was stored in spring-houses without any ventilation and kept very well. I find that one leading object in the construction of retarding houses is to prevent moisture and I would like to know if it is really injurious.

Mr. **ENGLE**. I have heard the same views advanced by others who claim that they can keep fruit in spring-houses without any difficulty. It is well known that fruit will shrivel in dry cellars and there may be some virtue in the moisture of spring-houses. I read some time since in the report of Michigan Horticultural Society. an account of a retarding house erected in that State, in which fruit was very successfully kept without any ice at all, or any refrigerating machinery. It was claimed to be a success and much more economical than with ice or machinery.

Col. **MCFARLAND**. I hope this subject will be fully and thoroughly discussed, as it is of great importance to all fruit growers. From the experience of some of our members, it would seem that moisture is not objectionable if the temperature is kept low enough. At our last annual meeting, Mr. Van Deman referred to a case in Kansas, where fruit had been stored in a beer vault, in which there was a spring, and kept nicely.

Mr. **BARTRAM**. I have a small retarding house, in which there is some leakage, some of the boxes of fruit getting one-third full of water without apparent injury.

Mr. **ENGLE**. Did the fruit keep as well when taken out of the house.

Mr. **BARTRAM**. I noticed no difference and heard no objections from parties who purchased the fruit.

Mr. **MOON**. Has Mr. Bartram ever tried small fruits?

Mr. **BARTRAM**. I have kept Niagara grapes until January 1. It does not pay to grow Lawrence pears unless I can retard them. I don't think I lost five per cent. of the fruit put into the house.

Col. **MCFARLAND**. Mr. Brelsford, of Harrisburg, has kept grapes and strawberries satisfactorily. Raspberries had been hauled around some before putting in and did not keep. Foreign grapes kept very well. Mr. Bartram says that fruit can be successfully kept with ice, but four-fifths of our fruit growers do not operate on a scale sufficiently large to justify the necessary outlay. I would be glad to hear Mr. Meehan's views on this subject.

Mr. **MEEHAN**. I am glad to find such a deep interest in this question as it is one of the most important that can be discussed at our meetings. It occurs to me that the question needs no argument, as all pomologists agree that moisture is destructive to fruit. The great and leading object in this construction of retarding houses, has been to get rid of moisture, and in some instances chloride of sodium has been used as an absorbent. A spring-house has not necessarily a moist atmosphere. Moisture is caused by the action of different temperatures, as is proven by placing a pitcher of cold water in a warm room

There is usually but little variation of temperature in a spring-house and consequently but little or no moisture.

Judge STITZEL. We have several retarding houses in Reading and there has been much improvement in those recently built. Drainage is considered of the utmost importance and the point is to drain the water out of the building. Fruit is usually allowed to get too ripe before picking. In order to keep well it should be picked early. Bartlett pears and apples should be picked about ten days or two weeks before they are usually considered ripe. Our first houses were built with ice on the sides, but later experience has proven that ice over the top is preferable.

Mr. ENGLE. I am satisfied that this is one of the important questons of the day for fruit growers. There seems to be no difficulty in the large cities, where plants of this kind can be conducted on a large scale, but the great want is something of limited capacity and cost for individual use.

Prof. BUCKHOUT. There are two important conditions necessary in keeping fruit. One is the atmosphere, the other is in the fruit itself. It is evident that any imperfection in the fruit when stored will be retained, and if the proper atmospheric conditions are maintained, the fruit will keep. If infected with fungi before it is put away, it needs only favorable conditions to develop. Recently I had some new varieties of apples, which I wanted to keep for testing, and they were simply put in paper bags and hung in the cellar. Several days ago I examined them and all were good but three. Something was evidently wrong with these when put away, and this factor will likely explain some of the contradictions noted.

President Cooper announced that Professors Meehan and Buckhout would both be obliged to leave in the morning. The evening session would therefore offer a double entertainment. All were invited to the lectures and he hoped all would be promptly on hand.

The following essay was read by Mr. Linville:

FRUIT GROWING ON THE PACIFIC COAST.

California is probably the greatest fruit-growing country in the world. To all the deciduous fruits grown here they add the citrus fruits, the almond, the olive and the pomegranate. The latter has no commercial value. The Japanese persimmon can be grown, but it is said the quality of the fruit does not warrant the cultivation of it in large quantities.

If there is one variety of fruit that is more than any other at home in California, I should say it is the apricot. I saw apricots everywhere—from Los Angeles to the Russian river country. Its fruitfulness is wonderful. I saw many orchards, large and small, and every tree was loaded with fruit. In some places hundreds of bushels lay under the trees for want of means to care for the fruit, or from carelessness of the owners. Grocers here are now retailing dried apricots at twenty-five cents per pound.

The absence of "yellows" in the peach, and of the curculio, make the culture of stone fruits comparatively easy on the Pacific coast. The French, or petite, prune is extensively grown in the vicinity of San Jose. As its thick skin prevents its drying well, it is first dipped into lye strong enough to float an egg, which bleaches and tenders the skin and renders its evaporation easy.

The fig is grown almost anywhere west of the Sierras. In its fresh state it is repulsive to most persons, and a taste for it has to be acquired. Here one may literally "sit under his own vine and fig tree."

The dry climate here during the summer season is most favorable to the grape. While wandering through those immense vineyards, I felt ashamed of my own poor efforts at grape culture at home. Here we train to buildings, to arbors, to trellises and to stakes. We prune and we pinch and we bag clusters. There they cut off the last year's growth close to the stump, about three feet high, and the vine is left to take care of itself. Of course the ground is cultivated between the rows A large number of buds start, and the tips of the canes soon reach the ground. Underneath hang the luscious clusters. Foreign varieties, such as Black Hamburg and Muscat, are raised. In midsummer, when the plains and hillsides are parched and brown, these great vineyards present a beautiful appearance.

In the Napa valley and other places, grapes are grown largely for wine, and in Fresno and Riverside for raisins. It is said that during the past season Fresno county alone shipped 4,000,000 pounds of raisins. The 1,000 acres of Muscats in Riverside, says the *Press* of that city, produced, in 1886, 140,000 boxes of raisins, or 28,000 pounds per acre, and netted the producer $168 per acre.

All are familiar with the immense pears and plums of California. The English walnut and almonds are extensively grown and yield beautiful crops. Olive culture is yet comparatively in its infancy. Elwood Cooper, of Santa Barbara, is the pioneer in this business, and has 7,000 trees on his ranch. His olive oil is reputed to be the best in the world.

The dry summers of California favor the ripening of the cherry, and I found the flesh of that fruit more firm and fleshy than with us.

Small fruits and vegetables are extensively grown near the southern suburbs of San Francisco, and in the vicinity of San José. Scores of wind pumps, set in motion by breezes from the Pacific, irrigate these gardens, and the result is fruit and vegetables of astonishing size.

I find a prevalent opinion that the citrus fruit region is confined to Southern California. This is not the case. Oranges are successfully grown five hundred miles north of San Diego, and even to Shasta in the north.

As regards the quality of the fruit I cannot speak so highly. The grape and the apricot are probably as good as are grown anywhere. The plum, the pear, the peach and the cherry are passably good when eaten at their best, but their apples are poor. Small fruits forced to large size by irrigation are watery and insipid. Strawberries in the San Francisco market were the largest and most beautiful colored I ever saw, but lacked that piquancy and aroma that characterizes our best berries here.

It is hardly just to criticise the orange in July, as it is then out of season, but any that I ate were thick-skinned and pulpy and, I think, far inferior to the Florida fruit.

If one would enjoy the glories of a tropical garden let him visit "Elwood Ranch," near Santa Barbara. It is the property of Elwood Cooper, a Pennsylvanian by birth, who made this wild Pacific shore to blossom as the rose. One side of the two thousand acre ranch is laved by the waters of the Pacific, and the other runs far up the mountain side. One hundred and fifty thousand Australian eucalyptus trees break the force of the winds, and render the gardens more tropical. The buildings are situated in a canyon in a grove of immense live oaks. The house is hidden in a tangle of climbing vines. Here are rare tropical plants in great numbers and the air is "oppressed with perfume."

But the California fruit-grower has insects to fight, and their name is legion. The Codling moth is fully as destructive as here, and it is said spraying has not proved a remedy. A small beetle is very destructive to the vine, and Phylloxera attack it at the root. Scale louse is a bad enemy to the peach, pear and other trees. Curl leaf is worse than here, and late frosts destroy the blossoms in some of the valleys. I noticed at Los Angeles that the oranges, trees and fruit, were covered with a black fungus that is fatal to the fruit, and will, in time, probably kill the tree. I saw at Elwood Ranch wagons fitted up with tanks and force pumps for spraying the olive trees. It is difficult to get at the truth in regard to these drawbacks, as the average native wants to induce settlers to come in and is interested in showing the bright side only. Occasionally you meet a man who will make a fair statement of the situation.

With the exception of some gnarled live oaks, the coast range and the valleys and foot-hills are mostly treeless. Many of the live oaks on the foot hills of the Sierras are covered with mistletoe. The great lumber forests in the north of the State and in the Sierras are of the pine family. Hard wood for mechanical purposes is scarce on the western coast. In fact the whole Pacific slope, from the Mexican line to Mount St. Elias, is timbered with the pine species. In Oregon, Washington Territory and the Puget Sound region they have yellow and red fir, red and white cedar and spruce and hemlock. The firs sometimes attain a diameter of ten or twelve feet and three hundred feet in height. In Alaska yellow cedar and hemlock prevail, but the saw-mill has not yet invaded the forests.

Oregon and Washington produce the same fruits that we do. Their plums and cherries are much finer in quality than those of California, and, not having the curculio to contend with, they grow prunes and other fruits to great perfection. This is claimed as a great apple region, but most of the trees that I saw presented a blighted, moss grown and forlorn appearance. I saw, however, some fine thrifty trees at Port Townsend, in Puget Sound. Grapes and peaches are uncertain in western Oregon and Washington Territory.

As regards Alaska most of the fruit I saw there was taken from Oregon or California. I observed wild raspberries, or salmon berries, as they are called there, growing in the forest near Sitka. They are large, seedy berries, red in color and very poor in quality. I saw gooseberries, currants and raspberries growing in a garden, and they seemed to be in a fairly thrifty condition; also potatoes and cabbage and other vegetables. The Rocky Mountain sides are covered with sombre forests to the water's edge. Here and there a narrrow valley, such as the Stickeen valley, contains some meadow land that might be susceptible of tillage, and I see no reason why apples might not do well there near the coast, where the temperature is mild and the climate very moist. There are no roads there. Traveling is done in canoes. I saw but one horse in Alaska and we took him with us on the ship. The forests are almost impenetrable. Huge fallen logs are covered with thick moss and long, green moss trails from the trees, and eternal dews drop from their dark foliage. It is the home of the bear and the deer and the mountain goat. Whales and seals disport themselve in its waters, and the great American eagle—the bird of freedom—has here his abiding place.

Mr. MEEHAN. I am glad my friend, in referring to the handsome fruits and possibilities for fruit culture on the Pacific coast, has also referred to the drawbacks and trouble encountered by horticulturists there. My own experience in traveling in the South and in California and Oregon, is that fruit growers and horticulturists meet with obstacles of some kind everywhere, and that after all Pennsylvania is as free from insects and other discouraging features as any portion of the United States. In fact, the evils which fruit growers have to contend with in California are greater than Mr. Linville has portrayed. Phylloxera has destroyed thousands of their vines. Apples are destroyed by Codling moth. Pear Blight has swept away thousands of trees, and at Fort Wrangle, in Alaska, I saw large fields of potatoes destroyed by blight or disease. There is no paradise but that serpents will creep in. All things considered, I believe we have less trouble from insects and diseases, and more to favor the fruit grower in Pennsylvania than in any State in the Union.

Mr. LINVILLE. There is one reason why insects are more destructive in California than here. Their summers are long and dry, and they have every facility for multiplying rapidly, here we have shorter summers and severe winters that, in a measure, prevent their increase. There they must depend upon other insects or their own individual efforts to counteract their ravages.

Col. MCFARLAND. I am satisfied that if fruit growers in Pennsylvania would give their business the same attention it receives in other States, the results would be equally satisfactory. When in New York, several years ago, I met a gentleman who, by constant attention to his plum orchard, succeeded in marketing a crop of 2,000 bushels. I believe the same care and attention in many sections of our own State would return just as large profits.

Mr. LINVILLE. While I saw many handsome orchards and much careful culture in California, I think the average fruit grower there is about as careless as any I have ever seen. Many sections in southern California are specially adapted to culture of oranges, lemons, grapes, figs and other tropical fruits. Oranges and lemons, however, are attacked by a fungus which threatens serious results. At Los Angeles real estate speculators are holding property at greatly inflated prices, and I would advise persons who contemplate purchasing to stay a year or two and take in carefully the situation before investing in fruit lands. Some soils abound in alkali, and are worthless for fruit or anything else. Aside from all these drawbacks, California is one of the greatest fruit producing countries of the world, and the industry is gaining in importance every year.

BEST METHOD OF ORGANIZING AUXILIARY SOCIETIES.

Mr. Longsdorf being absent the subject was taken up for general discussion.

The following letter was read by the president.

PICTURE ROCKS, PA., *January 13, 1888.*

Mr. CALVIN COOPER, *Bird-in-Hand, Pa.,*
President State Horticultural Association.

DEAR SIR: I address you this paper, desiring the same to have a place in your order of business, to be offered, as my affirmative support to the subject, "Best Method of Organizing Auxiliary County Societies."

It will be remembered that some five years ago we offered a paper recommending, and setting forth in a formal way, this subject, also the advantages which might accrue to the State society.

Holding their sessions separate, or in connection with county fair exhibits, during the fruit and vegetable seasons, a synopsis report from the record of the said societies at the State meeting would fill an important place in the General Fruit Committee's report.

To the same end and purpose, as a means to advance the horticultural interests in the State, we would suggest that proper persons be given in charge the work of formulating a common basis for county or town societies, to be offered to fruit-growers as a nucleus, subject to their approval and adoption; and that said societies have independent rules and regulations, governing their action, at the same time each society to hold membership relations, to, and with, that of the State; and to be represented at its annual sessions by delegates two or more each.

The seemingly too narrow basis on which the State society has been conducted, has resulted in a hindrance to its advancement; aside from the few counties in which it has been located, the larger part of the State have known less of its doings. Covering the entire State with the name, while only a few counties are reached, is a practice deserving comment.

Let us have the auxiliary system at once covering the State.

Most respectfully yours,

A. R. SPROUT.

Mr. ENGLE. I have given this matter some study and attention but do not know that I can offer any suggestions of interest or value. I think our society has made considerable progress during the past few years, and we are now represented in every county in the State but two or three. In a few instances local societies have been formed; and in this way our work and influence is being felt. In Michigan there are a number of county societies holding frequent meetings and sending delegates or representatives to the meetings of the State society. It will require time to get our work on a similar footing here, but by agitating and keeping the matter before the horticultural public we hope to succeed eventually. Hitherto our labors have in a great measure been confined to the eastern portion of the State. If we can awaken sufficient interest in western Pennsylvania to hold some of our meetings there, it will be a step in the right direction.

Mr. MEEHAN. I am much interested in the success of our society, and am glad to hear the suggestions that are made to extend its field of usefulness. We should try to show the people that our efforts are intended for their good, and by pamphlets and circulars call attention to the work we are engaged in, and invite all who are interested, to coöperate with us. It requires time and effort to accomplish this but we would thus be able to work up a sentiment that will aid us in the good work.

Judge STITZEL. This is a matter that is making satisfactory progress but will require some little time. Replies and correspondents from different sections are rapidly on the increase. A few years ago we had reports only from a few counties in the State. Now we have reports from all but two. The cause is spreading, and probably a circular, or a committee to aid the secretary, would do a great deal of good. I don't want to move the appointment of such a committee, as I have not the time to devote to the work that it deserves.

Col. MCFARLAND. As the secretary is now in communication with sixty-five counties, it occurs to me he would best be able to continue this work.

Mr. ENGLE. I move that a committee of three be appointed to aid the secretary in the further prosecution of this work. The resolution was adopted, and the following were named as said committee: Col. McFarland, H. S. Rupp and H. M. Engle.

A motion to adjourn was made but voted down.

A motion to have report of chairman of General Fruit Committee read was also voted down.

Mr. FOX. I would prefer that the reading of my report be deferred until another session. I have another matter I beg leave to present at this time. I have, and with your permission will read a list of sixty-one members from Berks county, who have paid their annual fees for the present year. My check for these dues will be handed to our treasurer before our final adjournment.

Mr. HOOPES. There are a number present who wish to see the plants and floral decorations on the platform, and. in order to afford all an opportunity to do so, I move we do now adjourn.

EVENING SESSION.

Called to order by President Cooper, at 7.30 o'clock.

The committee on nominations submitted the following list of candidates for the several officers for 1888:

President—Calvin Cooper, Bird-in-Hand, Pa.

Vice Presidents—Josiah Hoopes, West Chester, Pa.; H. M. Engle, Marietta, Pa., E. Satterthwait, Jenkintown, Pa.

Recording Secretary—E. B. Engle, Waynesboro', Pa.

Corresponding Secretary—W. P. Brinton, Christiana, Pa.

Treasurer—J. Hibbard Bartram, Milltown, Pa.

Librarian—Thos. J. Edge, Harrisburg, Pa.

On motion the secretary was authorized to cast the ballot of the society for the aforenamed candidates and they were declared duly elected.

President COOPER. I thank you for the honor conferred by re-electing me for another term. I would have much preferred the election of some one else as president, but as the committee would not accept my declination, I will serve to the best of my ability. It has been customary to hear the annual address of the president at this session, but as Professors Meehan and Buckhout cannot be here after this evening, I would suggest that it be postponed until to-morrow morning.

A motion to that effect was subsequently made and adopted. Music by Salem Lutheran choir under the directorship of Hon. C. R. Lantz.

Mr. Moon, of the Committee on Floral and Other Exhibits, submitted the following.

Your committee beg leave to submit the following report:

The exhibits which have surprised and delighted our association are without precedent in any former meetings, and bespeak for the citizens of Lebanon and vicinity the palm for floral decorations.

The magnificient collection of palms Cycas and Ficus and other ornamental plants from Mrs. Coleman add greatly to the beauty and attractiveness of the hall, and reflect great credit by their fine healthy appearance to the care and attention of her gardener, Louis Nelson.

The florists display of Wynings & Dace, of this place, is both magnificent and unique, and embraces several varieties of more than ordinary interest. Among them we note six specimen plants of the Narcissus or Sacred Lily of the Nile, in full bloom. Nine varieties of Carnation Pinks including Henzey's new white and several other magnificient new sorts. These and the other finely grown plants and cut flowers, which fill their table, are a display of great merits. The Temple of Immortelles and other dried grass of different colors is skillfully and wonderfully made. We wish to express our kind appreciation to this firm for the efforts they have taken to make this display, which shows us at once that the citizens of Lebanon are a flower-loving people, and have within themselves those who can supply their wants in the floral line.

The magnificently grown La France, Bennett and Pearl roses, from our worthy corresponding secretary, Wm. P. Brinton, of Christiana, together with the Garfield and Henzey's new white Carnations, Amaryllis Johnsonii, Calla Lilies and Brogmansia, form a great attraction to the floral table.

John R. and A. Murdoch, Pittsburgh, one plate of apples of evident value as a keeper. Name unknown to your committee.

Henry S. Rupp & Son, Shiremanstown, one specimen of Lemon peas and plate of Spanish chestnuts.

H. M. Engle & Son, Marietta, plate of Japan chestnuts and also a plate of their new chestnut, the Paragon. The latter is a fine large nut of good quality and evidently a desirable acquisition.

R. W. Scherer, Berks county, one plate each of Bear and Krauser apples.

J. E. Jamison, McAllisterville, one plate each of Hub, Nonsuch, and Ben Davis apples.

Robt. H. Coleman, Esq., collection of canned fruit and pickles.

The vegetable displays of Robt. H. Coleman and Mrs. G. D. Coleman are very fine and speak well for the productiveness of your beautiful valley of Lebanon, of whose beauty and productions we can say with one of old, "Not the half had been told us.

On motion report was accepted and committee discharged.

THE HORTICULTURAL FEATURES OF THE PRESENT MEETING.

Address by Prof. Meehan, of Philadelphia.

[Mr. Meehan did not speak from notes, and having no stenographer the following report of his remarks is very brief and incomplete.—E. B. Engle, *Secretary.*]

Mr. Meehan. I was somewhat amused by the announcement made in a Philadelphia paper that I would this evening speak on "The Features of the Horticultural Meeting." Although a transposition of my subject as announced in our programme, it would probably prove a broader text than the original, for the features of a horticulturist show people of noble hearts and generous dispositions. We have here before us a horticultural display from your best citizens. They are leaders in good woks, charitable and kind to the poor, and I am informed that strikes here are unknown. Those having a taste for, or who are engaged in, horticultural pursuits are generally among the most intelligent and benevolent citizens of a community. We are sometimes asked what is the use of adorning our homes, and what practical benefit can be derived from flowers? What does it benefit us to know many other things? There is no money in the sentiment of patriotism that is symbolized in the flag of our country, but something of far more value. Its stars and stripes have often done more for our country's cause than cannon and battalions. The care of plants and flowers fosters a sentiment of refinement and unselfishness that makes people among the best citizens of a community.

I ask your attention to different subjects and studies that may be taught and suggested by specimens here before us. They may suggest interesting facts in geography, history, geology, etc., as the case may be. Let us begin with the apple. With most persons the only questions of interest or importance are, is it good to eat, a good keeper, etc.? but there are other facts connected with it that are of far more importance. One of the first accounts we have of the apple was in connection with a little trouble in the Garden of Eden. But history shows that this was probably not an apple. It does not succeed where there is no frost. It requires a cool temperature where it can obtain rest. It begins to fail south of the Potomac, and does not grow in the West Indies. We do not know its native country, nor do we know what was the apple of the Garden of Eden. Some say the climate may have changed, but if we go back to Egypt where ancient tombs have been opened we find evidences that they grew the same fruits, flowers, vegetables and grains that they grow there now, with no apparent increase or change in size.

The native country of the apple is not positively known, but we find that it existed far back in history. It is found wild in England, France and here, but these are evidently wanderers from civilization that have gone back to their wild state. In this country the early Jesuit fathers introduced them among the Indians. The apple also plays an important part in science. Darwin, Sir John Lubbock and others who have investigated these matters, do not say that plants have a certain innate consciousness in themselves, and that they are affected the same as animals, but one might also infer so. It is said that the apple tried to make itself agreeable to man, so that he might eat and carry it away and disseminate it over the world. So also with cherries, which birds would eat and distribute and reproduce. Some seeds have wings, others are sticky and others again burst rapidly and scatter their seed in every direction. Some water plants have seeds that attach themselves to the feet of birds and are carried far inland where they grow and reproduce themselves. These facts show the lessons that many fruits and flowers teach us, and how much may be learned from their careful study. Here is some celery from which we can learn an interesting lesson in plant life. You have all heard of Socrates and his wife Xantippe. How henpecked he was and how he was forced to to take the poisonous hemlock and his life. Celery and hemlock, botanically speaking, are closely related. The one is a deadly poison the other a sanitary agent and highly prized as an article of food. In the tomato we have another instance.

From the stem we get atropia, a deadly poison, and yet the fruit is not poisonous. So with animals. The cow and sheep subsist on the same food and yet how different the flesh.

The potato would form an interesting topic for an entire evening's lecture. It is not a root as held by some, neither has it any characteristics of the bulb. It is a singular fact, also, that while the tuber consists chiefly of starch, the plant contains none at all, but is rather poisonous. While we do not know the native country of the potato, we know its culture has a wide range, and that it has in a measure acquired the habit of resisting frost.

Let us now turn our attention to some of the lessóns to be derived from the banana. In our horticultural meetings we have frequently discussed the question whether varieties run out. Some advanced the theory that certain varieties of trees had a certain time or period to live. That after a certain period all trees raised by grafts of that variety would die out. Arguing from analogy this position seemed plausible. Horticulturists are still discussing whether by propagating from cuttings instead of seeds, we are not doing so at the expense of vigor and vitality. The banana seems to refute this theory. It has not been grown from seed for two thousand years, and is as healthy and vigorous to-day as ever. It is a female plant, and the male plant is scarcely known. The common red currant has been in use three or four hundred years, and has been grown from cuttings all this time, yet it is as free from disease as ever. I saw recently, in a German work three hundred years old, that apples and pears carried from Rome to Britany by Julius Cæsar, were still being grown there. In some species of plants insects play an important part in their reproduction. The yucca is an example, and its flowers are so arranged that that they cannot fertilize themselves. Some say that color and attractiveness were given to flowers that they would attract insects. To some extent geology confirms this, as deep down in the earlier plant formations no evidences of colors exist, but they are found in the higher strata where insects appear. From this it is to be inferred that they are necessary to the proper fertilization of many flowers. Those interested in mythology well know the importance that was accorded to many flowers. The Grecians considered the Narcissus sacred. The story goes that Narcissus was a vain young man who thought himself handsomer than others from whom he kept aloof. Nothing gave him more pleasure than to see and admire himself, and the gods transformed him into a flower where he stood. From the Carnation we learn something of the ancient history of the Romans. "Dianthus" means "flower of the gods." In its wild state we can trace it back to a very early period. Its native home is on the ruins of old walls and castles in England, France, Sweden and other countries. It was a very small flower, not more than an inch across and very fragrent. It was so sweet and attractive to the Romans in the conquest of Britany that they took it back to Rome where it became their great favorite. It was cultivated everywhere, was used for chaplets for those they deified, and after death for crowning their statues. It was then very small and has only recently been improved in size, though it has lost much of its sweetness and fragrance.

From my disconnected remarks you can have an idea of the wide field of information and study that opens before us in the habits of plants and flowers. No one can be interested in, or follow horticultural pursuits without having broader views and becoming more intelligent and better fitted to fill their stations as worthy citizens and as useful men and women.

Prof. W. A. Buckhout, of State College, Pa., read the following paper on

THE RELATIONS OF EXPERIMENT STATIONS TO HORTICULTURE.

I do not think there can be any doubt but that the experiment stations recently organized under the Hatch bill are intended for the benefit of Horticulture as well as of general agriculture, and that the funds and attention of the stations should be employed in no small part toward the needs of the horticulturist. The stations already in operation have undertaken some work in this direction, and none, I think, have ignored its claims. In horticulture there are scores of questions continually coming up for experiment and solution (if that is probable), and naturally the experiment stations are now looked to for aid. These questions are widely different in themselves, and widely different in their practicability. The extremes are represented, on the one hand, by questions of pure science which may not be of any present practical value ; on the other hand by direct tests of methods of culture and of varieties—tests which would appear to be conclusive, and hence to secure results which will directly determine practice. The first named, which are strongly advocated by our scientific friends, do not at once commend themselves to the practical horticulturist since they seem to be questions of theory alone, and to be incapable of any practical application, but they should not by any means be despised.

It is a short-sighted and a narrow mind which can not be brought to see that all true progress is founded upon just such apparently abstract details which the patient laborers in the laboratory and the study have brought forth. At first such knowledge may have no known application, and hence no appreciable value ; it may appear as so many isolated facts bearing no relation to anything before known in practice, or likely to be known. But with further discovery it often becomes of the most direct practical use, and the wonder is that it has remained unused so long. Although the proofs of this find their best illustration in the application of the more exact sciences of chemistry and mechanics, they are not wanting in the practice of horticulture also.

Moreover there are many subjects of investigation which can be reached best from the side of pure science, if indeed, they can be reached from any other. Such, for instance, as various plant diseases, like the black knot of the plum, the rot of the grape, etc. Practically we are concerned with means for preventing or eradicating these diseases, but the first step in prevention calls for a knowledge of their nature. In the cases named all sorts of opinions were held upon this point until the systematic labor of the theoretical botanists gave us the true cause in specific germs, which finding here congenial places for their sustenance grow and multiply therein at the expense of the hosts upon which they have found a lodgement. In such instances cause and effect are so closely, and apparently inextricably intermingled, that nothing short of the rigid tests and cultures in the laboratory are capable of separating them. Mere superficial out-door observations while they may aid can never correctly solve such questions. They call for skill in the use of a microscope, a special knowledge for the interpretation of what is thus disclosed, and a degree of patience which few people possess. Application of remedies for these special diseases may be difficult, may even be unavailing, but we shall at least have the satisfaction of knowing that we are not working in the dark, and that the means which we employ are founded upon a definite conception of the nature of the disorder and are in accordance with the practice of our time. And so with the whole group of subjects which the practical man looks at askance, querying within himself what good can come of them. The scientific world is right in looking to these experiment stations for some work of this kind. It may meet with some unfavorable criticism, but we may rest assured that time will show its value, and if done with reasonable care and thoroughness it will eventually carry with it its own justification.

From practical horticulturists the most urgent and often expressed demand of the day seems to be in the testing of new varieties by actual cultivation and pronouncing an opinion upon their merits. I can not but think, however, that in an old-settled State like ours the value of such experiments is overrated. Then we reflect how much the influence of locality, through its soil and general meteorological conditions, has to do with varieties, it seems plain that a single place of trial in a State cannot arrive at any very definite conclusion in regard to particular varieties except, perhaps, in so far as relates to the immediate vicinity of that place. In this respect the testing of varieties will always be under a good deal of disadvantage. Moreover the number of so-called new varieties of our commoner fruits is so large that it would be a great task to care for and compare them, and in many cases the time required to pass a fair judgment is such as to make a further difficulty not easy to overcome. To some extent, however, some work of this character should be undertaken. I do not wish to be understood as discouraging all testing of varieties. It does not seem to me to be the most promising line of work because of the difficulties inherent in it, but we cannot afford to ignore it altogether. Of these two main lines of observation and experiment I am free to say that I look with most favor upon the former, and believe that however impracticable its subjects and methods of investigation may appear to be they will in the long run give the more satisfactory and permanent results.

The great objection to mere field observation and experimenting is the difficulty of properly estimating all the factors in the case, and hence the liability of drawing unwarranted conclusions—conclusions which subsequently are shown to have been hastily made and not in consonance with all the facts in the case.

One mistake of this kind throws suspicion upon everything else, and weakens faith in the judgment and ability of the experimenters. It is in this line of work that mistakes of this character are most likely to be made, and hence the need of caution in undertaking it. There are, however, many other subjects of an intermediate character on which we need more light, and my feeling is that a large part of our experiment work in horticulture lies between these two extremes which I have presented. The stations must first have available buildings and ground, and to these must be added such tools, plants, seeds, etc., as are necessary. Without designing to make an elaborate show everything should be so arranged and labeled that those who visit the grounds may at any time see for themselves what is being done, and have opportunity to note the general character and probable value of the plants and variety, and the methods, fertilizers, etc., used in their cultivation. A special effort should be made to procure such promising new species of plants as have not yet been introduced into cultivation, and, so far as seems practicable, efforts should be made to satisfy what I acknowledge is a very natural curiosity regarding various new varieties which are perpetually being thrust forward for public recognition. This is a feature of the station work which, if judiciosly managed, may be made of very great value to all who live within easy reaching distance and to those who can afford an occasional visits. There will always be some who will want to see with their own eyes, and who are able to inspect personally, and there must needs be a considerable amount of plants, shrubbery and fruit trees in any event. That which the college already has should, of course, be available for purposes of experiment. There may not then be so great a variety as in a botanical garden, nor such striking and bizarre effects as our public gardens afford, but we may reasonably aim at a moderate collection of well labeled and well arranged stock which represents the work which is being done, and is not kept for mere display.

I am not without hope that these stations may supplement that which has already been done for horticulture by the energy and zeal of private parties who have given us so many valuable things from foreign lands. The world is large and has not yet been exhausted of its horticultural treasures; and though we have been duly warned that some of our foreign acquisitions are not standing the test of time satisfactorily there is this to be borne in mind, namely, that the parts of the world which from botanical considerations are most likely to give us species which our conditions are congenial have been as yet only imperfectly examined, and there is good ground for believing that we may yet receive from this source valuable additions to our plants of use and beauty. Our United States Department of Agriculture might readily become the depository for such material, and distribute it to the different State experiment stations. From thence all which was of real value would soon find its way to the people through the ordinary channels. In the line of direct experiment I regard the practice of spraying fruit trees as an exceedingly promising one which has not yet received the attention which it deserves nor reached the limit of its usefulness. It was introduced some years ago in order to destroy the insects which prey upon the foliage and fruit of various trees, and those who have given it the most careful and thorough tests are very nearly unanimous in praise of its merits and efficacy. I should like to see it tried under more rigid conditions than have heretofore been employed, under such conditions as would leave no doubt of the correctness of the results obtained. The display of these results would then be conclusive of the value of these processes. Heretofore, I believe, they have been employed solely against insect ravages. I suspect that there is a further and a wider use. There seems to be two great difficulties in the production of perfectly formed and full-sized fruit. One is in the attacks of insects which not only eat up or destroy but which prevent the fruit acquiring its normal size and shape; the other is in some unknown agency, suspected to be of fungal nature which produces much the same result as does insect attack. Fruits, particularly those of the apple kind, become gnarled, misshaped and develop hard, woody spots, so that they are almost useless. In many sections this is a more serious matter than the ravages of the insects. A large crop may mature, but only a very small part of it be marketable, and the rest not worth the handling. The soft fleshed fruits, plums, peaches, etc., are affected in the opposite way. They rot. Trees may set a full crop of fruit and every condition, so far as we can see, the tree, the soil, the air be favorable for its growth and maturity; and yet the great bulk, sometimes the whole of it, rots and drops some time before it is ripe. This is now the greatest difficulty in the raising of these fruits. The curculio once considered to be the greatest enemy of plum culture, is a minor matter compared to this. I am aware that these defects are sometimes more noticeable in certain varieties than in others, but there is good ground for believing that it is not a mere varietal taint, but that it is widespread, and is more or less marked in all varieties and all the old fruit-growing regions. Tradition has it that this is a comparatively new enemy, that it was practically unknown a century ago, and is even now not of any moment in the new districts which are remote from the old.

However true this may be, it is evident that this has now become so serious an enemy to fruit-raising that some means should be sought to remove it. The most feasible, to my mind, is in this practice of spraying some substance which is unfavorable to the growth and development of these fungi, which have been suspected as the cause. It would be hard to estimate the money loss to our fruit growers through defective fruit. It is one of the most frequent complaints which we hear from both producers and dealers, and if practical means of remedying this difficulty could be devised it would be of very great value.

Much has already been done in testing seeds, and I believe with good results. The demand for this work may seem to be a limited one, and one easily met, but when we consider what large quantities are used year by year, and from what diverse and sometimes unreliable sources they come, it seems proper to conclude that this species of work will always be fruitful of good results. Private parties may do it, but the facilities which a station has should be specially adapted to such tests, and hence their results should have a greater degree of accuracy than is attainable in other hands. In this connection come tests not only for vitality, but for various other properties which their is reason to believe are variable quantities, and thus directly affect the work of the gardener. I need not rehearse to you the inestimable service which the practice of crossing and hybridization has already rendered to every department of horticulture. Its history makes a large part of the progress of that art, and without it we should have missed entirely many of the best, useful and ornamental things we have. And this field has not, by any means, been exhausted. It can still be very profitably worked. I, therefore, favor the continuation of experiments in this direction, believing that it will furnish us many new things, some of which cannot fail to be of permanent value. Moreover, if the stations do their duty and live up to the measure of their privileges, they should be able, in time, to throw some light upon the question of the relative influence of pollen and ovule, and give us some guide toward securing certain desired ends, such as vigor and strength of plant without the sacrifice of quality and flavor in fruits, and to breed for specific points without the certainty of breeding in the animal world. Correlative to this is an interesting field of experiment on the relation of fertilization of the flower to plant productiveness, and the manner by which pollen is transferred, which, so far as I know, has been but imperfectly studied by horticulturists. We are all well acquainted with the fact that, except in a few peculiar cases, fertilization is absolutely necessary to fruit production, and, moreover, that there are various ways by which pollen is transferred; sometimes by the agency of wind, sometimes by insects. Sometimes resulting in close fertilization; in others, in a crossing which is generally understood to be of marked value in keeping up the vigor of the species. It is no unusual thing to find trees and vines which are apparently in first-class condition producing a satisfactory growth of leaves and wood, and yet are unfruitful. There are probably many causes of unfruitfulness. Some quite plain, such as imperfect flowers and the like; others not so easy to understand, as various popular notions would have us believe. From a few rather hasty observations, I have been led to suspect that we may often find the cause, not in the running to wood, as it has been called, nor to the lack of any necessary food constituent, nor to cold weather at the time of blooming, but rather to the destruction of pollen by rain. If, for instance, there is continued wet weather during flowering, and grape vines which are exposed set but little fruit, while others in a protected situation, but in every other respect as nearly alike as possible, set fruit in abundance, there is a very strong suspicion that the wet weather is at fault. And when we note the facts which botanists give us on the loss of vitality in pollen which has been wet, and see the extent to which pollen is washed away by rain, we think we can see how the weather produces this result. Nevertheless we should accept unquestioned no such explanation as this. Rather should it suggest to us the need of a careful experiment, in which every factor of the weather and the plant should be fully noted, all sources of error eliminated so far as is possible, and then see what sort of a result is obtained. Or with like carefulness try the effect of an artificial rain just at the time of the shedding of the pollen. Our surmise of the unfruitfulness may have been correct, but only by such experiments as these can it be really proven.

Few questions in garden or field cultivation have attracted more attention, alike from theorists and cultivators than that of the maintenance of fertility and the fertilizers necessary to accomplish it. It is a perennial topic of discussion in every farmers' meeting, and opinions upon it take the widest range. Full agreement goes only so far as to admit the general value of fertilizers in making ground rich, and in good condition for the support of average crops. The question of specific fertilizers for specific purposes, and the relative value of different fertilizers brings out a multitude of experiences of the most conflicting character. The expense of the commercial fertilizers is such as to make any positive knowledge on the subject of exceeding great value to the cultivator. The general effect of fertilizers seems to be a double one. They not only quicken and invigorate plant growth, and thus increase production, but they seem by this very vigor to enable plants to resist the attacks of such enemies as insects and fungi, as it were, to outgrow them or keep out of their reach. Some have even gone so far as to maintain that perfectly healthy plants are not affected by fungi at all. However this may be, there seems no doubt of the general beneficial effect of the fertilizers upon all plant growth. The value of specific fertilizers, particularly in their reference to production of specific effect, such as fruitfulness, that which is most commonly desired, is still almost an unknown quantity. In the field of general agriculture, where this has been a subject of investigation and experiment for many years, no very definite or satisfactory results have been obtained, and the question may be one of such intricacy and complexity that we are not destined to unravel much more of the secrets of nature in this direction than we have already done. But in this, and all lines of work, nothing is really lost by a failure of this kind. Negative results may be disappointing, as results contrary to our preconceived ideas generally are, but they may be none the less valuable and instructive. And if, in the exercise of our experimenting, some horticultural delusions should be swept away, let us not berate the means by which that has been done, but rather let us accept the inevitable and profit by it in our future practice. We smile at the credulity of people a generation ago, and wonder at some ideas which they so tenaciously held; it behooves us to be cautious lest we appear in the same light to the coming generation. However, the great interest in fertilizers and the widespread belief that if we knew more about their action we should find them valuable adjuncts to gardening and fruit-raising, will make further experiment in their use advisable.

These are a few of the topics which seem to me to open legitimate and promising lines of investigation in horticulture for these newly-organized experiment stations. Many other, and perhaps more important ones may occur to you. The field is large enough. The great point is to cultivate it judiciously and carefully, striving to do thorough work, and to make that work conform so fully as possible to that which seems to be the greatest need. One other suggestion and I have done. Never before has such liberal provision been made for experiment work. Every one of the State industrial colleges is made the recipient of national funds, and each one is left to carry out the purpose of the act by such tests and experiments as its management shall deem best. It is at once apparent that while each is an independent organization, all are interested in much the same lines of work, and the question immediately arises can they not coöperate and thus work to more purpose than if they worked independently? It would avoid the duplication of some simple matters which need no duplication, and enable them to join forces on questions which need investigation from different sides and under different conditions. There has been a tacit understanding that this would be done. I hope it will not be lost sight of, and that we may have such a coöperation established. I am confident that it will do much toward the success of the stations, and toward making this work acceptable to the farmers and horticulturists in whose interest they have been established.

Having now given you a hasty outline of what I conceive to be the mission of the experiment stations, I cheerfully give way to others, that we may have a free interchange of opinion upon this topic which is of mutual interest. I have viewed it from the stand-point of a teacher and an amatuer. Many of you are engaged in horticultural pursuits as a business, and we should have an expression of opinion from all. Honest opinion and honest criticism are always in place. Let the experiment stations hear from you, and you will be more likely to hear favorably from them in return.

President COOPER. Professor Buckhout has offered some very practical suggestions and it seems to me the subject might be very profitably discussed.

Mr. HOOPES. I have never given the matter any thought and am not prepared to offer any suggestions.

Col. **McFarland.** At our last annual meeting I offered the resolution urging our members of Congress to support the Hatch bill, and I have no doubt the thorough work proposed will bring good results. It occurs to me that if we as horticulturists take proper interest in these stations and use our influence and assistance in making practical experiments we will reap corresponding benefits. We should all feel that we are only students and beginners and that we have much to learn. I think much valuable information will be disseminated and I will be disappointed if we do not reap many benefits from these stations. I hope Professor Buckhout and his assistants will have the aid and coöperation of every member of our association.

Prof. **Buckhout.** One thing more I would like to impress upon our farmers and horticulturists. I hope they will let us know their wants and difficulties. These would suggest to us the lines of work that ought to be investigated and result in our mutual benefit. This whole matter is new, and unless we feel our way and go slowly, we will be likely to run to extremes.

On motion the hours for meeting were fixed at 9 A. M. and 2 and 7:30 P. M.

Adjourned.

MORNING SESSION—THURSDAY.

Called to order by the President at 9:15.

Mr. Bartram, treasurer of the association, submitted his report, which was accepted and referred to an auditing committee consisting of H. S. Rupp, J. C. Linville and J. G. Engle, by whom it was found corrrect.

ANNUAL STATEMENT OF THE TREASURER.

J. Hibberd Bartram, *Treasurer, in account with the State Horticultural Association of Pennsylvania.*

1887.	*Dr.*		
Jan. 20.	To cash on hand as per report, ...		$494 25
	To cash for annual dues of members, ...		72 00
March 1 to May 18.	To cash for annual dues of members, ...		24 00
May 1.	To cash for postage, ...		3 01
			$593 26
1887.	*Cr.*		
Jan. 20.	By cash paid E. B. Engle, as per bill, . .	$49 38	
	By cash paid S. Knauer, janitor, ...	1 50	
	By cash paid J. Godschalk, as per bill, .	2 87	
	By cash paid C. T. Fox, as per bill, . . .	27 95	
Feb. 21.	By cash paid F. S. Hickman, as per bill, .	2 00	
Apr. 28.	By cash paid E. B. Engle, as per bill, . .	38 07	
			121 77
1888.			
Jan. 19.	To balance on hand, ...		$471 49

President COOPER read his

ANNUAL ADDRESS.

To the Members and Friends of the State Horticultural Association:

Again it becomes my duty to address you (as per an established custom) at this twenty-ninth anniversary since the organization. Although it seems but a short time since our annual meeting at Bethlehem, we are reminded by the change of seasons, that another year has passed into history, and the journey of life, of each and every one of us, is just that much nearer the end of our race.

The season which has passed has been one especially trying to the horticulturist. Insect enemies, drought, excessive heat, mildew, blight, black rot, premature ripening, yellows and divers other causes, seem to have all concentrated in southern and eastern Pensylvania during the summer of 1887; beginning early in the season, and continuing during the entire summer, with such devastation as to leave but a pittance in many instances for the anxious care-worn cultivator. I do not now remember of any preceding season when there were so many obstacles, so much to contend with, and one that the percentage of good fruit and of a part of the vegetable crop (potatoes excepted) was so small as the one just passed. The fruits in some sections were almost an entire failure. Strawberries, the first fruit of the season, seemed to have been injured at the time of blossoming, consequently were but sparsely set and very imperfect. Currants and gooseberries, where the worm has not been looked after and destroyed, the bushes have become so weakened that production of their usual crop is an impossibility; but notwithstanding the easy manner of destroying how few avail themselves of the method, but instead allow the insect to entirely denude the plants. Raspberries in my district suffered from the canes being frozen the previous winter, consequently there was no fruit except near the ground. Blackberries, although there was an abundant show of fruit early in the summer, the excessive heat, and a dry time of ripening, hardened the fruit on the bushes to the injury of the crop. A cold rain on the bloom undoubtedly drowned the cherries. Of the peach there seemed to be an abundant set of fruit. What came of them no one could foretell, and but few realized after they were gone. Some have charged the failure to the rose bug, and accused the innocent little fellow of feeding upon the fruit before it was ripe. This accusation seems preposterous, as there are but few insects that feed upon either the leaf or the fruit before it is ripe. The extreme bitterness of the leaf is such that but few insects will take to it, and then only in the absence of other food.

The apple, evidently the most useful of all our fruits, that which supplies the luscious dumpling, fritters and sauce for the table, were conspicuous in their absence, at the time they are usually harvested. We have no other fruit that enters so largely into our diet, and contributes so much to our health; and its susceptibility of being served in many dishes, fills a place in the wants of the human race as well as of the lower grades of animals, that cannot be dispensed with in this climate. It seems to be a wise provision of Him who rules over all, that while some sections may fail, others are blest with an abundance and to spare, so that all may be supplied. Although south-eastern Pennsylvania had comparatively none, the northern part of this State and Western New York were blest with one of the finest crops that ever grew. So great and fine was the fruit, that defective and inferior grades were the exception: And although there was a large quantity of barrels on hand, and the factories running to their fullest extent, the supply was soon exhausted. This, with the scarcity of transportation, left thousands to rot in the orchards. Thus it seems that one section may have a failure, while others have an over-abundance, that all may be fed.

The caterpillar pest of last season is yet fresh in our memories. Its ravages excelled all precedents; its propensity to devour and persistency to find the last leaf, seemed to have no bounds. Having denuded the trees, corn, grass, and other vegetable matter were sought to satisfy its voracious appetite.

I doubt not that after having been stripped of their leaves by this caterpillar pest the second time, many of our trees went into the winter season with poorly ripened wood, and imperfectly formed fruit buds. Some of the latter, indeed, came into bloom last fall, six months ahead of time, which undoubtedly will materially injure the crop of the next season. If the horticulturist could be influenced by the prevailing customs of this generation he might have just cause to *strike* (that being the war cry), and notify the enemy that unless we can have better prices and more remunerative crops, no more planting will be done. I think I hear an emphatic, no, sir! away down in the depths of your souls. We are not made of that kind of material. While many grow fruit for market, nine-tenths of us are engaged in the work as a pleasure, and the luxury of fresh fruit from the trees to supply our daily wants, besides the beautiful sight it affords in the surrounding of every home, to say nothing of the health-giving properties, will amply repay the labor and expense. Notwithstanding the many obstacles and disappointments of the fruit-grower, we have much to be grateful for. A productive soil wherein one crop may not be as large as we had hoped, another will supply the want, so that with the variety usually grown there is little danger of failures all round. The diversity of situations, and the peculiar characteristics of each, are quite sure to produce to a greater or less extent, each year, in proportion as this ever-changing climate may cause the influences that bring results.

Having had many unexpected failures we should not despond. The products of our gardens and orchards are essential to our existence. It is the untiring zeal of the industrious gardener that leads to financial success, and supplies the markets with the luxuries of life. Thomson says:

> "It is success that colors all in life;
> Success makes fools admired. Makes *Villians* honest;
> All the proud virtue of this vaunting world
> Fawns on success, and power, howe'er acquired."

The establishment of the Bureau of Pomology in the Department of Agriculture by the Government, it is hoped will in the near future assist us to overcome obstacles, which as individuals we would be unable to combat. But in order to expedite the good work it is the duty of all interested in the destruction of insect enemies, blight, yellows, and all manners of fungus formations injurious to fruit or vegetable growth, to coöperate with Commissioner Colman and his able assistants, who are endeavoring to collect all the information obtainable, so that some intelligent action may be taken for the discovery of remedies and the removal of the causes and effects. The horticultural experimental stations established under the "Hatch bill," will, it is hoped, be the nucleus around which we may look for the means to ward off enemies, and lead to more successful results.

How to extend the usefulness of this association has frequently presented itself to me, but as yet I am unable to suggest any feasible plan, or to advise any new idea by which we could practically branch into a new field. One of the members from Lycoming county suggests the formation of "auxiliary societies in each county;" but our meeting in his district a few years since did *not* indicate such interest by the people of *that* district, that would justify the expectation of coöperation on their part. True it has been asserted, that although the apartment in which we met was most elegantly furnished, the means of access was so circuitous as to deter all who did not have a guide to show them the route, from attempting to gain admission. I, however, feel that we should not condemn the committee of arrangements for the selection of the place, for I fully believe that the people of Lycoming county are as deeply interested in horticulture as the average of those in other districts, and with judicious advertising and an ordinary place of meeting, the sessions of this or any kindred association would be well attended. This being the only State association, should we not meet occasionally in other districts more remote from its birthplace? Might we not, with both pleasure and profit, extend a visit to the central or even the northern part of the State? Our past experience should not deter us from at least giving our western friends the opportunity to extend the hand of welcome and fellowship. Lebanon, Dauphin, Cumberland, Franklin, York, Lancaster, Chester, Berks, Lehigh and Bucks comprise a very small portion of this great Commonwealth; and I, for one, am ready to accept Horace Greeley's advice and "Go West," not, however, to the extent that some of our horticultural friends are now enjoying in a trip to San Jose and Riverside, California, where they contemplate holding their annual meeting. This, indeed, would be very enjoyable at some other season, but the prevailing storms on some of the routes at the present time, with the mercury at 25 and 30 degrees below zero, and a howling gale of forty miles an hour, would chill all the ardor of a pleasure trip, and the charm of a visit to the Pacific slope.

The constant introduction of new fruits, vegetables and flowers is to be commended, but not to the exclusion of the older and well-tried standard sorts. The proportion of really good and desirable acquisitions, in new plants is too small to accept the foundling as a treasure, and cast off the old. The prevailing practice of extolling the recent introduction, for the purpose of extorting a high price, is (in many instances) the motive that the originator and his agents use for their own selfish purposes. The magnified illustration, together with the glowing descriptions and wonderful productiveness of a few interested persons, are all well calculated to mislead the unsuspecting and induce a purchase of an article at a fabulous price, of little or no value except in very limited districts where it originated, and possibly a few others of similar character. That we have had in the last decade many new plants of value is not to be questioned, but the same period has also produced hundreds that are worthless except in very limited districts. I must therefore admonish you, that while it may be advisable to continually experiment, and place upon the trial list many or all of the first prize acquisitions, do not exclude the old standard sorts that have been the true source of supply from the orchard, garden and lawn.

The preparation of a fruit list as directed at your last meeting at Bethlehem, it is hoped, will materially assist in averting what have heretofore been very perplexing failures. The multiplicity of varieties has always been the stumbling block to the inexperienced planter to know what to select for his district. The long list in the descriptive catalogues of what are recommended as good, only tends to confuse rather than enlighten. By the reports forwarded from nearly every county in the State, planters will be able to see at a glance what varieties take precedence in each district, and thus be able to select with some degree of success, such as will be the most remunerative in their respective localities. This has been a work of some magnitude, and your worthy secretary has, by his persistent determination, obtained such intelligent reports, that a less zealous officer would not have accomplished. The circulars prepared and forwarded into every county in the State were so plain and concise that any one of reasonable intelligence could not misconstrue the intention, and return the report duly numbered according to his preference. This being the first effort to prepare a list for the State, it may not embody all the information desired, but it is hoped will be the foundation of a fruit list, if such a one can be formulated, for the whole Commonwealth.

The wonderful productiveness (more particularly of apples) of some of the northern counties, should be an incentive for the planting of more and larger orchards. There are doubtless thousands of acres of cheap lands in northern Pennsylvania, that with but little expense for preparation would be well adapted to the growth of this indispensable fruit. And I am yet in hopes that the day is not far distant, when we can boast in the production of as good or better apples than our sister State bordering on the north. I know no reason why, with the many acres and favorable localities, we might not supply our home trade, and become competitors for a share of foreign also. We have also many other districts, more particularly the higher altitudes, where peaches and the smaller fruits succeed admirably well; hence, why go to Maryland and Delaware. Do not Pennsylvanians possess the energy and perseverance, or desire, to grow the luxuries of life, as the citizens of her sister States? Or are there other vocations that are less perplexing and more remunerative, that induce their adoption as a means of support? I am quite confident that many of our laboring classes, now trudging out a miserable existence, could, with but little capital invested, live in comfort by the growth of fruit for market. This may not accord with some remarks made in the early part of this address, when I alluded to the thickly settled section where fine crops are the exception, where insect enemies have established their home, and climatic influences are too often adverse.

The growing thirst for home adornment tends to a higher state of civilization. The increasing tendency toward ornamental gardening is conclusive evidence that the people in the rural districts have acquired a love for the beautiful. Their well-clipped lawns, borders of ornamental foliage, plants and shrubbery, compare favorably with those of the cities, and in many instances excel them. The wayside cottage of the workman, also is not a stranger to the ivy and ampelopsis, flowers, and ribbon beds. They, too, have acquired the taste for home attractions and are rapidly becoming educated to a higher standard of citizenship. This is a feature that should be fostered on every hand. The inviting and happy home should be every man's paradise. With cheerful surroundings his first object would be his family, after the toils of the day are ended. Otherwise recreation is too frequently sought in the rum shop, store, or other resort, where slang and the vices of the neighborhood are discussed to the disgrace of the vicinity. Hence I assert that every employer who desires to elevate the standard of his employés should lend every inducement within his means and encourage home comforts and attractions. A little more space around the house or garden would not be missed from the plantation. A few trees and plants, supplied occasionally, would be paid many fold by more energetic and interested labor.

In conclusion, allow me to express my most grateful acknowledgements for your kind and courteous attention; feeling that I have transgressed upon your valuable time, and hoping that the continuation of this meeting may be harmonious, and the topics discussed result in much good to all.

FRUIT-GROWING AND BEE-KEEPING.

Remarks by DR. CALDER.

Fruit culture is one of the most honorable and pleasant avocations, when honestly and intelligently pursued. The growing of stock and grain is a profitable business, but, all things considered, fruit-growing is more pleasant and equally remunerative. I claim, further, that by adding bee-keeping, the profit will not be diminished, while the pleasure and satisfaction will be materially enhanced.

It is said that bees are injurious to fruit, and many intelligent persons still believe this theory. The fact is bees do not puncture fruit. Robins and other birds break the skins of grapes, rains cause them to burst, and then bees fall to work and suck the juices. This has been proven by experiments made by Mr. McLane, an employé of the United States government, who has placed them in houses without any honey and a good supply of fruit, and the bees actually starved to death. Similar experiments have been made by others at other places, extending over two years, and all go to prove that bees cannot puncture the skin of the grape. This objection, therefore, does not hold good.

Others object because the management of bees requires too much time, but this is not necessarily the case. Neither are bee-keepers likely to be stung to death, as is claimed by some. Love your bees and they will love you. I have often been among them for weeks without one sting. I received but one sting last season, and that was done in self-defense.

My wife also is interested in them, and often assists in their care and management. She does not even wear a veil, as many do when working about them.

There are still others who would not keep bees because they will annoy and sting employés and live stock, and because neighbors may object. The last named is an objection that should be considered, but I know from practical experience that the business can be conducted so that there need be no objection on the part of our neighbors.

There are several reasons why those engaged in fruit culture can keep bees profitably. One, and a most important reason is, because they have the best pasture. It is not white clover nor bass wood, but raspberry blossoms, which make better honey than either. I have Brandywine, Gregg, Philadelphia, Herstine and American Black Cap, which blossom at different periods, thus giving a succession of excellent pasture. Gooseberry and blackberry blossoms are also excellent pasture.

Bee-keeping will open new channels of duty, and give variety o employment to members of the household. A father is in honor bound to make work as pleasant for his boys as possible. If by stock or fruit growing, all right, if by the management of bees, all right again. Bees also aid the fruit grower materially in the making of his fruit. Winds blow over our grain fields and fertilize the plants when in bloom. Winds *may* also fertilize our fruit blossoms, but bees will always do it. The Creator has painted flowers and blossoms in beautiful colors, and filled them with honey to attract them. If we want blossoms thoroughly impregnated we should have bees. A few colonies can be kept at comparatively little expense.

Nothing we do on the farm costs so little time and trouble, and brings such returns. A good hive will last a lifetime by keeping it in repair and giving it an occasional coat of paint, and there is no trouble in raising several new colonies every year. Good honey is always in demand, and we have never sold a pound for less than twenty-five cents.

If the demand is not active we need not sell at once, but can hold for better prices. Two years ago I went to see Mr. Vandevoort, of Bradford county, who makes a patent comb foundation. He has 400 or 500 colonies of bees, and his honey brings him more ready cash than is received by any farmer in his county. He makes the business a specialty, and it pays him handsomely. Why can we not do as well by combining the business with fruit growing?

Last of all, I prefer the Italian to any other bees. The common bees are more inclined to sting. The Italian lays earlier in the season, can work better in red clover, is very hardy and easily increased. Try the Italian and no other. Let me suggest also that you use only one kind of hive. Some bee-keepers have two or three kinds of hives of old style, from which it is next to impossible to remove the honey without killing the bees. Get hives with moveable frames, so that the honey can be removed with the least injury and annoyance to the bees. I have found no better hive than the "Simplicity." It is simple, durable and convenient, and answers the purpose admirably.

Let us aim to be intelligent and observant bee-keepers, and we will find the business not only pleasant but profitable.

President COOPER. We have had a very interesting address from Dr. Calder, and the question is now open for discussion.

Mr. MOON. What is a fair yield of honey in a season from a colony of bees?

Dr. CALDER. I am hardly able to say definitely. Much depends upon the season. Some seasons fifty pounds is a fair product, while under other circumstances twenty-five pounds would be a good yield. However, the outlay of time and money is so small that even if we get but little honey we cannot say we have lost money. Thirty, forty and fifty pounds are a fair season's yield, and if the object be honey alone considerable more may be obtained. By extracting the honey, and putting back the combs to be refilled a much larger product is the result.

On motion a vote of thanks was tendered Dr. Calder.

Col. McFARLAND. If the secretary is prepared to submit his fruit list for the State, I suggest that it be next in order.

The SECRETARY. The report is ready, but as it is very lengthy and consists entirely of statistics and figures, I do not think it would be desirable to spend time in reading it. It would probably be better to submit the report for examination to such as wish to see it, and if accepted, the necessary action can be taken by the society later.

President COOPER. I think this would be the best manner of disposing of this report, and it will be placed on the table for your inspection.

On motion of Mr. Snavely the following report was submitted:

REPORT OF COMMITTEE ON ORCHARDING.

By Col. GEO. F. McFARLAND.

To the officers and members of the State Horticultural Association of Pennsylvania:

GENTLEMEN: Last year your Committee on Orcharding discussed the practically important question, "Can orcharding be made a financial success in Pennsylvania? And if so, what shall we do to secure that success? We will not repeat the arguments and facts then adduced or inquire whether they carried conviction to other minds or not. But of this we are very confident. Another year's experience and observation satisfy us fully that we can make the following much broader and more comprehensive statements as facts either self-evident or easily established, viz:

1. That the growing of all kinds of fruit can be made financially successful in most parts of Pennsylvania by applying to it the same attention, skill and means business men use, to make other branches of business successful.

The best proofs of this assertion are the facts. Intelligent, skilled and attentive men are meeting with the most gratifying financial success, in both a large and small way, in every section of the State, some with one, and others with another, variety of fruit, thus, in the aggregate, embracing every variety in cultivation. It seems hardly necessary to give illustrations, and we have room for only a few:

Messrs. Rakeshaw & Pyle, of Chester county, reports one-fourth acre of Crescent Seedling strawberries, fertilized by Sharpless in every sixth row, planted in the spring of 1886, from which the owner sold $250 worth of berries last season (1887). Planted on rather low, moist, rich clay loam, used the year before to raise tobacco.

Mr. Hibbard Bartram, same county, has ten acres of apples which bore an excellent crop last year, 1,000 bushels or more, of which he sold at better prices than heretofore, because by cold storage he was able to preserve them till demand at good prices came. His orchard is thirty years old, in good condition, on nearly level loam land, surrounded on north, east and south by Norway spruce hedges about forty feet high, with woods on the west. The varieties are Summer Hagloe, Stride's Birmingham, Bough, White Doctor, Fallawater, Hubbardstown Nonsuch, and Smith's Cider. For several years he pastured hogs in it a good deal.

The peach orchard of eleven hundred trees, in Juniata county, reported last year as having produced six thousand two hundred crates in nine years, is a good illustration of financial success.

Mr. Jamison reports this year another orchard of twelve hundred trees in the ninth year produced $1,600 worth of fruit. Another of twelve hundred trees in the fourth year $1,200 worth. A hundred thousand trees under skillful culture, on well-drained slopes, are producing the most satisfactory results, while some orchards in the same locality, but uncultivated and neglected, are failures.

2. That the degree of success can be readily foretold, and will be in exact proportion to the care used in selecting soil, exposure and stock, in planting, cultivating and protecting from insect enemies, and in gathering, grading, preserving and marketing.

We could fill pages with illustrations from the actual experiences of both large and small growers of the truth of this statement. The past year was certainly a trying one to fruit growers. But those who improved its opportunities will be all the better prepared to meet the same difficulties when they occur hereafter. Perhaps farmers had as serious failures in crops and prices and as many causes for discouragement.

During the past ten years the writer frequently sold peach trees to an acquaintance in Harrisburg, who has justly won the reputation of always having large crops of particularly fine peaches. Last year was no exception with him, and he sent a part of the product of a four-year-old Red Cheek Malocoton tree to a relative in Union county, to whom he had sent some of the trees when he planted his. His neighbor came in and paid him $5 for what he had left, after using for his family freely. Visiting his Union county relative recently, the size and appearance were strongly commended, and he was asked: "What is the reason you can raise such fine peaches at Harrisburg when they will do no good here?" My acquaintance said he did not know, but said he would examine the trees that failed. He found them poorly located, uncultivated and neglected, and took from them (to use his own words) "worms large enough to fish with."

Here good stock carefully planted on good soil, properly cultivated and protected from insect enemies, and the fruit skillfully handled, brought profitable and satisfactory results, while the same stock, treated as too many treat their stock, signally failed. And what is true here in a small way, is just as true where thousands of trees are handled.

We do not say there will be no failures. But we do say:

3. That with trees, vines and small fruits, well grown, thoroughly healthy, and preserved from insect enemies as far as possible,

(*a*) Failures of crops will be less frequent, certainly no more frequent than failures in grain, produce, live stock and poultry.

(*b*) The fruit will be larger, finer looking and of better quality.

(*c*) It will keep better, sell more readily and bring a better price. And what more can fruit growers ask?

4. That all kinds of fruit will mature earlier, and therefore require more skill and care to preserve in Pennsylvania than in States farther north. But nearer and better markets make it cheaper and easier to sell, and improved machinery for preserving, by means of retarding houses, enable producers and dealers to regulate the markets if they coöperate for that purpose, as they can so readily do.

5. That farmers of this State, even the better ones, can now make little if any money in raising grain and produce alone, because of

competition of those who can raise grain so much cheaper on the rich prairies of the West, and produce so much earlier in the Sunny South. The following, from the *Germantown Telegraph*, good authority on such subjects, gives a good illustration of wheat raising, equally applicable to other products of the farmer's labor:

"The cost of a bushel of wheat has slowly sunk in value from the high water mark of $2.25 per bushel to the present price, 60 to 70 cents. Let us see what the actual cost of an acre of wheat in Ohio really is. The rent of an acre of such fields as are usually devoted to wheat, the best on the farm, is as low as $6.00; cost of plowing, $2.00; harrowing, rolling, etc., $1.00; 1¼ bushels of seed, $1.12; drilling, 50 cents; harvesting and drawing, $2.00; threshing and marketing, $2.25; total, $14.87. If the interest on cost and the wear and tear of a binder be added, it will be found that the cost of harvesting will not be greatly lessened from the old estimate for hand work. Some items may be over-estimated, but as a whole they cannot be materially changed. If an acre of wheat costs fifteen dollars, and fifteen bushels are not produced at a price of one dollar per bushel, the producer does not receive reward for his labor. And yet fifteen bushels is rather above than below the average. The grower receives less than a workingman's wages and takes the risk, which is, with wheat, greater than with any other crop."

This shows that it is necessary for farmers to inquire what other profitable uses they can make of their land. And without stopping for argument we add the following reasons why every one of them should devote at least a part of their land and time to fruit growing.

6. That fruit growing in some of its forms is among the most suitable and profitable branches of industry that can be made to add to the farmer's income.

7. That fruit growing is among the most pleasant, interesting and healthful employments the tillers of the soil can engage in.

8. That fruits, as they come fresh from the bush, vine or tree, form one of the cheapest, most palatable and healthful articles of food for all ages and both sexes during many months of the year, while those preserved in some of the many forms now so well understood continue the supply during the balance of the year.

9. That the demand for fruits of all kinds is far beyond the supply, and is growing faster than the supply in most parts of the State. And with successful machinery for the retarding of fruits easily secured by coöperation in every city, town and village, the period for marketing each kind of fruit can be lengthened until it is wanted at paying prices.

In the absence of statistics, it is difficult to estimate accurately the quantity of fruit imported into the State. But it is known to be very large. Thousands of bushels of berries and peaches and tens of thousands of barrels of apples and pears come to Harrisburg every year, and to other cities and towns in the same proportion. And with the aid of refrigerator cars it is coming earlier and later in the season and thus lengthening it. This is not an unmixed evil, for it is increasing and extending the demand. All fruit growers need do is supply this demand. And if they had for profits nothing but the cost of freight and handling foreign fruits, it would make a handsome addition to their wealth, besides increasing pleasant and profitable employment upon our farms.

Fruit growers and dealers should coöperate in building retarding houses. By forming a company and dividing the cost of the plant, this can be done anywhere. Five thousand dollars and upwards will secure guaranteed establishments that will preserve fruit at ten cents per barrel per month, and pay dividends at that rate. These establishments can also make ice at fifty cents per ton when not needed to preserve fruit, and sell it at a handsome profit. In fact cooling the retarding room and making ice can go on at the same time, up to the capacity of the machinery, thus making it very practical in its character.

Your committee conclude, therefore, that there is no good reason why Pennsylvania farmers and fruit growers should not take courage and embark more extensively in the business, determined to supply fully the demand for fine fruit in our own State, and when this is accomplished, compete for the trade of other States.

Respectfully submitted.

GEO. F. MCFARLAND, *Chairman*.

Mr. H. A. Chase in the chair.

On motion the report was accepted and a vote of thanks tendered Col. McFarland.

Mr. FOX. I expected to be able to present report of General Fruit Committee at this session, but it is still in the printers' hands and will likely be ready at the opening of the afternoon session. Meanwhile, I suggest that we now take up the question of a place for our next annual meeting. When Lebanon was suggested at our last meeting the statement was made that we have but few members at Lebanon and that but little interest would be manifested in our meetings. The result speaks for itself, and shows how greatly we were mistaken. I am sure that before we adjourn to-night this county will enrol as many members as any of its size in the State. By changing our place of meeting and going into new territory we interest many who otherwise would know little or nothing about us. I suggest, therefore, that we meet next year at Lewistown. It is in a county where we have never met, and I have a very cordial invitation from one of our members there, Mr. Ort, asking us to come there, and promising us some new members. I nominate Lewistown.

Mr. FULLER named Pittsburgh.

Mr. RUPP proposed Harrisburg.

Mr. WITMER. Several years ago we had quite a good meeting at Lancaster. I think we can do even better in case you meet there again. I nominate Lancaster.

Mr. LANTZ. I think your meeting here proves that it is well to go into new territory. In Harrisburg we can reach the politicians but not those who are interested in horticulture. Let us go where we can develop an interest in our work. I am in favor of Lewistown.

Mr. WOODS. In behalf of Harrisburg I would say it is central, easy of access from all portions of the State, and I think we will be able to interest more persons there than elsewhere. We will endeavor to work up a full meeting and do all we can to make it a success.

Mr. MOON. I do not live in a town large enough to meet in. Last winter when invited to meet here, many of our members thought that having only one or two members in Lebanon our meeting would be a failure. On the contrary we came here and found a reception such as we have never had before. What a contrast with our meeting at Harrisburg. There we met in the Senate Chamber, occupied the seats of the Senators; had the Governor to address us. All this was pleasant, but brought us no members, and no ladies attended our meetings. Next winter the Legislature will be in session, and all interest will be centered in political matters. As to Pittsburgh, it is so far west that I fear we could not get our members there.

Mr. HOOPES. Twenty-four years ago a little handful of members, ten or twelve in number, met here in annual meeting. A great snow storm prevented a larger attendance, and the meeting was a failure in consequence. Having but few members in the county, I have not been in favor of meeting here, but I will take back all I have ever said or done against coming to Lebanon. If my remarks have had anything to do with the grand reception we are having here, they may be productive of good. In regard to Lewistown, if this is the way we are to be received in new fields, I am in favor or meeting there. The invitation from Mr. Ort comes with double force, and something tells me that we should accept the invitation. I second the motion for Lewistown.

Col. MCFARLAND. I am surprised at the objections urged against Harrisburg. We know better now what will please this association. We have plenty of flowers and plenty of suitable places to meet. If we had a Fox or a Stitzel or Snavely to work up the details we would be able to promise still more. I believe, however, that going west will be the thing, and will do all I can toward making the meeting at Lewistown a success.

Mr. RUPP withdrew Harrisburg.

Mr. FOX. Harrisburg having been withdrawn, I trust all will unite in favor of Lewistown. It is an enterprising place, in the midst of a good fruit growing district, and will likely increase our list of members.

Mr. FULMER. I hope Pittsburgh's claims will not be overlooked. Let us take Horace Greeley's advice and "go west." If new members are wanted, we have a large city, and much interest is felt in horticulture and fruit growing. I think we would have a good meeting in our city.

Mr. JAMISON. Lewistown has good hotels and will give us good accommodations. I am frequently asked why our association does not come further west.

Mr. ENGLE. We met once at Pittsburgh, but it was a summer meeting and was not well attended. However, our membership westward is increasing, and we should go gradually in that direction, especially when inducements are offered. I trust we will accept the invitation to meet at Lewistown.

Mr. WITMER. I withdraw Lancaster.

A vote having been taken, Lewistown was selected unanimously.

Mr. CHASE, chairman *pro tem.* At our last annual meeting the Committee on Constitution and By-Laws submitted a report which, under the rules, was held over until this meeting for final action. I would suggest that the matter be taken up and disposed of now.

On motion of Col. McFarland, the amendments were taken up in order.

Article I. This society shall be entitled "The State Horticultural Association of Pennsylvania," and its object shall be the advancement of the science of horticulture and pomology.

Adopted as read.

Article IV. The following committees shall be appointed: A committee of five on nomenclature; a committee of three on insects, of which the professor of entomology shall be chairman; an executive committee, consisting of the elective officers of this associatiod, and three of whom, including the president, shall constitute a quorum; and a general fruit committee, consisting of one member from each county represented, with a general chairman of the whole, each member of the fruit committee to have the privilege of appointing two assistants.

On motion adopted.

Mr. HILLER. Would it not be well to omit the Committee on Orcharding from the list of standing committees? It is not provided for in the constitution or by-laws, and I think the same ground is covered by the General Fruit Committee.

Col. McFARLAND. While this is a question for the society to decide, it seems to me that if there is no conflict between it and the work of the General Fruit Committee, it should be continued.

Mr. CHASE. I think it should be continued as a special committee, as at present constituted.

Dr. CALDER. I move it be continued as a special committee.

Adopted.

On motion adjourned.

AFTERNOON SESSION.

After calling the meeting to order, President Cooper asked the attention of the association to the fruit list as submitted by the secretary. Thus far it refers only to apples, but if it is the wish of the members the work can be continued until the entire list of fruits has been reported upon.

Col. McFARLAND. I offered the original resolution authorizing this work by the secretary, and am proud of the child. It occurs to me it is the most practical and valuable work of the kind we have ever undertaken. I beg leave to offer the following:

"*Resolved*, That this association extend its thanks to Secretary Engle for his zealous efforts to carry out the resolution of last year to secure a practical fruit list for the State, and that he be authorized and instructed to continue during the coming year to gather facts that may enable him to report lists of the varieties of other fruits found most valuable for market and home uses, and compile and report the same to the next annual meeting."

Adopted.

REPORT OF GENERAL FRUIT COMMITTEE.

GENTLEMEN: To increase the interest in the work of the association, an effort was made during the past year to obtain a correspondent in every county in the State. The committee was, therefore, enlarged, until all but five of the sixty-seven counties are now represented. The five without representation are Cameron, Forest, Lawrence, McKean and Pike. Four of these counties contain no fruit-growing districts of any extent, but it is hoped that they, too, may be brought under the banner of the association. The request of your chairman, as to the pomological and horticultural results of the past year, met with a hearty response, and reports were received from every section of the

State, only a few counties having failed to respond. From some of the counties in eastern Pennsylvania, in which the association has a larger membership than in the central and western portions of the State, a number of reports have been received, the investigation as to the fruit results of the year not having been confined to the committee. The facts gleaned from this voluminous correspondence are herewith submitted in as condensed form as possible:

Apples.

The apple crop in general was poor, both as to quantity and quality. In some counties, however, the yield was exceptionally good, and even in counties where most orchards produced poorly, there were favored localities where fine crops were realized. The mountain districts of the State and the northern tier of counties were the most fortunate, but in nearly all other sections the crop of apples was below the average of former "off" years. Most of the replies as to yield were expressed in the single word "light." In counties, however, where there were good crops, the quality was poor. Much of the fruit dropped in the latter part of the season on account of the drought. In the south-eastern section of the State, comprising all that portion lying east of the Blue Ridge, the extremely moist and hot weather of midsummer had a disastrous effect. The visitation of leaf-eating insects was also unusually severe. The codling moth caused much of the fruit to drop before it was ripe. A. R. Sprout, of Lycoming county, reports a new seedling apple, which appears excellent; size medium to large; color faintly striped with red; flesh juicy and tender; remarkably fine flavor; ripens first to mid autumn; tree a fine grower.

Pears.

There was a fair yield of pears, although the crop was, by no means, large in any county. In some parts of the State there was less than half the usual crop. Almost every county reports damage to the trees by blight, and the fruit injured by the ravages of insects. The overbearing of trees in the previous year had much to do with the failure of the crop in 1887, and another cause was wet weather, both during the blossoming period and in the hot month of July. There was but little blight in the counties along the Ohio border, and in Beaver, Crawford, Washington and others in the western part of the State the trees produced abundantly. There were no reports in regard to the newer pears. The Keifer is reported to have yielded heavily in Bucks county, while in Columbia it did worse than ever, and the Duchesse was not much better. In the latter county there was a full crop of pears, and no blight.

Peaches.

In the eastern and south-eastern sections of the State the peach crop was a failure. Favorable reports, however, were received from the northern and western counties. In south-eastern Pennsylvania the crop was short on account of the cold rains in spring, while the trees were in bloom. What fruit set and matured, decayed badly, owing to unfavorable weather. Through the Cumberland Valley some peach orchards yielded largely, but the crop as a whole, was not an average one. In some of the western counties the crop was the largest in many years, except in Beaver, where it was almost entirely destroyed by rose bugs. The crop was good in that county where it escaped the bugs. In Crawford county, every variety bore well, and a more extensive crop was never gathered in that section of the State. The same statement is true in regard to the adjoining county of Warren, and other localities in the north-west. In Clarion, the peach crop was so large that the fruit sold for a mere song. Moving eastward, the crop in Clinton is reported to have been "extra," both in quantity and quality; and in Columbia it was "too full to mature perfectly." In most counties, however, very little attention is paid to peach culture. This is due to the diseases that growers must contend with, the principal being "the yellows," the origin of which remains as great a mystery as ever. At the annual meeting of the Peninsula Horticultural Society, held at Dover, Del., on the 11th inst., the subject of "the yellows" was discussed at length and the stamping-out process advocated. The secretary was instructed to ask the Legislatures of Maryland and Delaware to enact a law compelling growers to destroy all trees as soon as the symptoms appear.

A. R. Sprout, of Lycoming county, writes: "My late experience in growing peaches is to plant the stones where the trees are to grow, in rows ten or more feet apart; thin out and bud; fertilize with any kind of farm manure, including wood ashes, charcoal and ground bone; plow so as to turn the earth towards the trees as long as you can do so, which serves to keep the fruit back both fall and spring, and enables the trees to stand the drouth."

Plums.

Two-thirds of the counties of the State reported the plum crop to have been an entire failure. In the remaining third not one-half an average crop was realized. The large crop of the previous year, in some localties where the trees overbore, was followed by a total absence of fruit in 1887. The curculio continues to be the chief enemy of the plum, but during the past year "the rot" was the main cause of failure. With most growers no varieties have turned out "curculio proof," but where the fruit was saved from the ravages of the insects by jarring the trees, the rot finished the crop. The varieties principally recommended for general cultivation in the reports are the Richland, Damson and Lombard. The disease commonly called the "black knot" has proved a serious drawback, and discouraged people from giving to the plum the share of attention which its importance as a fruit deserves. This fungus growth is mainly the result of neglect, and good, clean culture and prompt amputation are recommended as the proper remedies.

Quinces.

The cultivation of the quince is receiving greater attention, and the crop, when it succeeds, is very profitable. Where orchards have been established near the large cities, handsome returns have been realized. The fruit is not given the attention it deserves in the State at large, and the reports from a number of counties indicate that only a few trees are planted in the gardens for the home supply. The borer and codling moth were unusually destructive last year. The latter was severe upon the tender fleshed kinds. Some localities, however, were favored with exceptionally good crops, both as to quantity and perfection of fruit. This is true of Beaver, Bucks, Crawford, Huntingdon, Northampton, Washington and other counties. In Columbia there was a large crop, but the fruit was defective. In Montgomery county there would have been the usual good crop of Champion quinces, but the trees were completely stripped by all sorts of leaf-eating insects. The Orange is the variety most extensively cultivated. Meech's Prolific has been introduced in the south-eastern section of the State, but no reports were received as to the results. Some fine specimens of this variety were seen by the writer at the Burlington county, N. J., fair.

Cherries.

The cherry crop was poor throughout the State, most counties reporting an entire failure. Some correspondents attribute the cause to rain during the blossoming period. The sour varieties are reported as the most profitable, the sweet varieties invariably rotting, like the plums, before they get ripe. The Early Richmond seems to be a general favorite. Other varieties that are favorably mentioned are: Governor Wood, May Duke, Black Eagle and Conestoga. One correspondent reports having some Dyehouse trees which came into bearing last spring, and, according to his experience, this variety is not earlier than the Early Richmond. Another correspondent remarks that the market for cherries is easily overstocked; when the crop is not shortened by rain during the picking season, the price received barely pays the cost of picking and marketing.

Grapes.

The reports show that there was a quite satisfactory yield of grapes all over the State, but in many localities there was a great deal of rot and mildew. In other sections the crop was injured by hot, dry weather; while insect pests destroyed the foliage and shortened the time of marketing the fruit by at least two weeks. Where fruit was bagged early, results were good. In the opinion of a number of correspondents this was no year to report on new varieties, as the Concord and other old reliable kinds showed considerable rot. The Concord, however, continues to be the favorite variety in nearly all counties. "Nearly all new varieties were a failure, and if we want grapes we must plant Concords," writes one correspondent. Crawford county says: "The Concord is the only variety that pays in this section." This opinion is reiterated by a number of other counties. Of the newer varieties the Brighton has proved itself valuable. The Worden, Moore's Early, Empire State and Red Wyoming are highly commended by several correspondents. Of the white grapes the Niagara is reported to have rotted badly, while the Pocklington ripened its fruit almost perfectly.

Small Fruits.

Generally, the crop of strawberries was good, but the season was short. Most correspondents report a full crop, but others speak indifferently of the results, only from one-fourth to one-tenth of a crop having been realized. Of other small fruits—raspberries, blackberries, gooseberries and currants, the returns were medium. Raspberries and blackberries suffered much from drought. In central Pennsylvania strawberries were hurt in the blossoming period by heavy and continous rain; and raspberries were damaged by severe storms during the picking season, which shortened the crop about one-half.

Chester county reports a very poor crop of Sharpless strawberries, which, outside of Crescent Seedling, has been the leading variety in that section of the State. Those who were fortuate enough to have Crescent patches had a fine crop, and other varieties being a failure, of course the Crescents brought a better price than usual. One farmer who had one-quarter of an acre realized $250 from it. Dr. J. H. Funk, of Berks county, raised 600 bushels of strawberries last year, mostly Crescent Seedling, which were unusually fine. His Sharpless berries were also good.

The originator of the Sharpless strawberry reports the crop in his county (Columbia) to have been the most complete failure for many years, on account of heaving. James Turner, of Crawford county, gives this opinion: " For all kinds of soil the Crescent comes first, then Downing and Sharpless." As to raspberries, the Cuthbert is recommended by a number as the leading red variety, and Soubegan and Gregg among " black caps." In many localities raspberries and blackberries were winter-killed. Very few correspondents reported in regard to currants. This fruit was scarce in the south-eastern counties, and commanded high prices. The stalks were greatly injured by slugs and worms, and in some sections almost destroyed.

Vegetables.

This important branch of horticulture is receiving greater attention, and farmers, as a rule, give more importance to the kitchen garden. It now comes in for its proper share of farm work, and is no longer committed to the sole care of the female portion of the household. The season was, for the most part, favorable for vegetables although some counties report the season too dry and others too wet, The early part of the season seems to have been better adapted to the production of vegetables than the latter portion of summer. In most sections of the State there was an unusually large crop of potatoes. Late cabbage, however, did not yield more than half a crop, and tomatoes failed during the month of August owing to the severe drought. Much complaint is made by cabbage growers in regard to " stem rot," some of whom report that it was worse during the past season than they ever experienced. Tomatoes rotted badly early in the season, and after the first run of early varieties there was a general scarcity and prices ruled high. Celery grew well and was unusually fine where it had been planted early. Onions were more than an average crop. No reports were received as to special varieties of vegetables.

Shrubbery, Plants and Flowers.

It is gratifying to be informed by correspondents that there is a growing inclination throughout the State to improve grounds and door yards by the planting of shrubbery, creeping vines and shade and ornamental trees. Floriculture is also increasing, and greenhouses in the rural districts are no longsr unusual. In referring to this commendable feature, the members of the General Fruit Committee use expressions like the following which have been culled from the sub-reports: " Marked improvement, especially in flowers." " Lawns about the houses are being improved, and annually a great many new things are planted." " Our people are beautifying their homes, this being particularly noticeable in our town." " Progress in floriculture quite noticeable." " In looking back over the last thirty years the progress in this line is wonderful, and is increasing yearly." "There has been more special interest taken in shrubbery, flowers and greenhouses during the year just closed than ever." "Taste in the decoration of grounds increasing." "Our people are gradually making advances." "The cultivation of shrubbery, plants and flowers is increasing." These are but a few of the statements of correspondents in regard to this branch of the association's work. The celebration of "Arbor Day" is another beautiful observance introduced in this State, which, it is hoped, may be perpetuated. It is developing a taste for tree planting, and especially among school children. Through its kindly influences every school yard will in a few years be provided with kindly shade, and every man of prominence will have some tree named after him by the school children of the State. The pupils of the public schools will also acquire instruction through the planting of trees, and will learn that nothing valuable is to be obtained or preserved without labor, care and attention.

General Observations.

The fruit season of 1887 had its drawbacks and trials. The raising of fruit for market is beset with difficulties, and failure is as likely to be the result of the harvest as success. The bitter, however, must be taken with the sweet, and while it is natural to complain if a particular crop does not come up to expectations, there should be a spirit of thankfulness for the great gifts vouchsafed by a kind Providence.

An esteemed correspondent writes: "The season was the worst I ever knew for all kinds of tree fruits. The long spell of hot and moist weather in midsummer seemed to be the principal cause." Although this was his experience, he no doubt found amid all that he had to contend with, much to encourage and sustain him.

In the writer's own county of Berks a friend started a fruit farm of 365 acres, and after expending large sums for manure to bring it up to a proper degree of fertility, and planting orchards of the most approved varieties of apples, pears and peaches, besides setting apart a considerable area for grapes and small fruits, he is about to curtail his operations to the extent of one-third. In place of fruit, he has resolved to take the advice of Governor Beaver, given last fall at a meeting of farmers, and raise chestnuts. One hundred acres will be set out in chestnut trees, and the same tract of land will be devoted to the raising of pigs. He calculates that while now he has no fruit to sell he will at the end of another season have a few pigs to spare which will net him some money.

Apropos, in this connection, attention has lately been called to a new American seedling chestnut, which has.bee nnamed Paragon, and is highly spoken of. The parties now controlling the entire stock in this country write of it as follows: "We have nothing to take back from what we have said and published of it. We are becoming more confirmed each year that there is no variety growing that is of more value or more desirable, but if there is we shall want it just as soon as we can get it."

In regard to the obstacles which fruit growers encounter, Vice President Henry M. Engle writes: "There are many drawbacks to fruit culture, but the greatest are want of fertility of soil and insect depredations. Other things being ever so favorable, the watchword must be counteract the insects if you want sure crops. This does not refer to fruits only, but to most vegetables as well, and we know of no better method than that practiced successfully by some in the different States, viz: Kerosine emulsions and mineral poisons, the latter applied judiciously."

A. L. McKibbin, of Beaver county, member of the State Board of Agriculture, reports in regard to this subject of insect pests: "Our people have become greatly discouraged on account of the ravages of rose bugs. For the past two years these insects have devastated whole communities, destroying all fruits, save pears, quinces and plums; and taking entire fields of strawberries and raspberries. Are there no ways of arresting their depredations? Perhaps this would be a proper subject to discuss at your coming meeting at Lebanon." An answer to the question propounded will be found in Mr. Engle's remarks, given above.

J. K. Sharpless, of Columbia county, writes in regard to new varieties of fruits as follows: "All new varieties of fruits fail to meet my expectations. I think the habit nowadays of pushing out new and untried varieties, which lead to disappointment in nearly all cases, is doing a great injury to the fruit business. Many persons are shy of new things in that line, and I am one of them." Another correspondent writes: "Our vicinity is not given to much confidence in new varieties from the fact that they have been duped so often by unprincipled agents or firms."

J. W. Pyle, of Chester county, makes the following observation: "Outside of perhaps a half dozen individuals, our people are neither fruit nor vegetable growers, for market purposes. They are mostly dairymen, and although they plant perhaps one-half or three-fourths of an acre of ground to apple trees, very little care is given the orchard, and about the only winter apples that are consumed are bought by the barrel from dealers in New York and north-western Pennsylvania."

Henry W. Comfort, of Bucks county, recommends the application of potash to peach trees, to secure the best results. He uses muriate of potash and acidulated South Carolina rock.

O. D. Schock, of Berks county, observes: "The principal cause of failure in raising pears is, in the writer's humble opinion, neglect to properly fertilize the trees. Personal observation has confirmed this."

Casper Hiller, of Lancaster county, says: "It may be of interest to note that the pear blight that has destroyed two-thirds of the trees during the last twenty years has entirely disappeared from our grounds. Some of the old trees that were half dead are making new growth." In regard to new varieties of fruit, the same gentleman says: "Among grapes, Moore's Early, Worden and Pocklington are great acquisitions. The Marlboro' raspberry is best among all we ever tried. The May King strawberry has a perfect blossom, is of better quality, and as productive as the Crescent."

Gabriel Hiester, of Dauphin, says: "I think the general failure this year was largely due to the loss of vitality caused by the enormous crop of the preceding year, and have no doubt that this one season of rest will enable the trees and vines to regain their accustomed vigor."

Henry C. Snavely, of Lebanon, writes in regard to his peach crop of last year: "I had a fine crop of peaches; the best, in fact, that I grew yet. Even trees that I was afraid had over-borne the previous year made an excellent crop of fruit. I have abandoned the use of yard manure in my peach orchards, and use kainit and ground bone, and I think with beneficial results. The trees are more exempt from disease and the fruit is of finer quality." Mr. Snavely also uses nothing but "kainite" and bone on his grape vines.

Peter Lint, of York county, a member of the general fruit committee, made a trip to the Pacific coast last summer and remained until late in the fall. He had the kindness to send the writer several San Francisco newspapers containing articles in regard to the fruit crop in California. He reports that the tree fruits in that State are mostly all a full crop, and of remarkably fine quality.

In regard to horticultural adornment, Thomas B. Meehan, of Germantown (member of the committee from Philadelphia county), writes: "There are probably more ornamental trees, shrubs, etc., planted than there are fruit trees. The suburbs of Philadelphia are noted for their beauty, and every one takes a pride in striving to outdo his neighbor; and it may be truly said that the love for landscape art is steadily on the increase." The same correspondent adds in a note: "Since writing my report I have been talking with a gentleman, who thinks quinces would prove very successful if anyone would give them the attention required. He has a few trees of the orange quince which yield him a good crop every year."

Henry Ort, of Mifflin county, writes an interesting report containing several suggestions, and your chairman would recommend that it be read in full.

All of which is respectfully submitted.

Cyrus T. Fox,
Chairman General Fruit Committee.

Reading, Pa., *January 18, 1888.*

On motion, a vote of thanks was tendered Mr. Fox for his very able report.

President Cooper. It is customary to give this report the widest discussion, and we want to give the citizens of Lebanon and vicinity an opportunity to present their views in a practical way. In our printed programme, under the head of "Topics for Discussion," we have a general fruit discussion, I would suggest that in order to avoid repetition and save time, we embody those topics in our discussion of General Fruit Committee's report. General discussion of Mr. Fox's report is now in order.

Mr. Woods. According to my observation and experience, York Imperial is the most profitable apple for this section of the State. By some it is not considered first-class, but if used in proper season it is very good. Mr. Brehm, near Bendersville, in Adams county, has eighty-five trees planted thirty feet apart, and in 1885 sold $2,000 worth from his orchard. Last year, 1887, he sold $1,400 worth. This apple is found all through this section of country, and though it is liable to scald if picked and barreled early, I think a majority of our members to-day, if planting for market, would plant three-fourths York Imperial.

Dominie is also very popular, and Krauser does well. I know also a party near Dauphin who does well with Smith's cider.

Mr. Fulmer. York Imperial is comparatively unknown in western part of the State; would like to know how it succeeds there.

Mr. Engle. Mr. Waring, of Tyrone, says York Imperial and Smith's Cider do not succeed there.

Mr. Fulmer. I would like to call the attention of fruit-growers to

"Williams' Favorite," which is considered our best early apple. It usually sells from 25 to 50 per cent. more in our markets than any other variety of its season.

Mr. LANTZ. Many of us who live in cities have only small gardens or lots, and but little room, and the question is what to plant to give a succession of good fruit.

Col. MCFARLAND. In a small lot of that size it would be impossible to grow any great variety of fruit. About one early apple and a few pears, peaches, grapes and a quince would be all he would have room for, including, of course, a few of the small fruits, such as currants, gooseberries, raspberries and strawberries.

Mr. ENGLE. In a case of this kind I would recommend a few dwarf trees. Or if more variety is desired, grow larger trees and graft several kinds on each tree. As to the varieties to recommend, that is a different question; see what varieties succeed best in your locality and be governed accordingly.

Mr. HILLER. I am surprised to hear Mr. Engle recommend dwarf trees where room is an item. We want trees that will grow upward; not near the ground. There is always plenty of room upward. There is much difference of opinion as to the utility of dwarfs for any purpose.

After a short recess business was resumed, and the subject of "pears" was taken up for discussion. In connection with this topic the following from the "Query Box" was read: "What is the cause of blight in the pear, and best method of preventing the disease?"

Col. MCFARLAND. Of late years blight has not been so bad as formerly.

Mr. JAMISON. We have had more blight in our vicinity the past year than ever before.

Mr. FULMER. It has been very destructive in our locality. Probably 50 per cent. of the pear trees have been destroyed in some sections.

Mr. ENGLE. Blight appears periodically. Some seasons it is much more destructive than others. The best cure seems to be to cut away the affected part and burn it.

Mr. FULMER. It is said that "an ounce of prevention is better than a pound of cure." I would like to know some preventive. Some recommend oil. Has it proven of any value?

Mr. HEPLER. So far as my experience goes oil will do no good. The only remedy that has proven successful is to cut back severely.

Col. MCFARLAND. Some five or six years ago I cut back a number that were blighted and they did very well.

Mr. RUPP. As to the cause of blight, I believe it is the result of freezing of the sap.

Mr. BRINSER. I have a pear tree about 15 years old which blighted two years ago. I cut it back to the sound wood and it has shown no symptoms of blight since.

Mr. JAMISON. Several years ago my pear trees did not make fine growth and in order to help them I dug up the ground and applied barn-yard manure. The following year all blighted. I think barnyard manure will cause blight, especially when applied to young trees.

Mr. HEPLER. I cannot agree that barn-yard manure is a cause of blight. I use it largely, top dressing my garden heavily every year, without any apparent bad effect.

President COOPER. If nothing further to offer on this question we will go on to the subject of "Peaches." In connection with this topic I will read Query No. 2:

"Has any member of this association discovered earlier symptoms of yellows, than premature ripening of fruit?

'J. T. SMITH, *Juniata county*."

Mr. SMITH. I have nothing new to offer on yellows, more than I think we have discovered symptoms that are earlier than premature ripening of fruit. We are not yet fully satisfied and would like to know if others have noticed any earlier symptoms.

Mr. JAMISON. I contend that I can detect yellows a year before it is manifested in the premature ripening of fruit. In the first place affected trees have more buds and they are more prominent than on healthy trees. They are also larger and more fully developed and will bloom several days earlier and more profusely. In one instance I noticed a tree that did not seem to make a thrifty growth. The shoots were heavy and the buds also heavy and large. I watched it carefully, and in two years it had yellows. I consider lime and potash preventives. I have an orchard which I do not believe ever had any lime, in which I had as fine a lot of Salways, 275 in number, as ever grew. In the fall of 1886 I cut out four trees that had symptoms of yellows, and last fall (1887) I think that fully 100 trees were affected. Mr. Smith has had less yellows, and all his orchards were limed. The best fertilizers for peaches are hard wood-ashes and German kainit. I have never raised finer fruit than with these fertilizers.

Mr. BRINSER. I would like to know how to prevent peach yellows. Some time ago a correspondent of *Farm Journal* stated that ashes and lime cause yellows. Others say these are preventives.

Col. MCFARLAND. I would like to inquire of Mr. Jamison whether orchards that are best cultivated are more free from yellows?

Mr. JAMISON. Yes, sir; the better they are cultivated the less yellows. The orchard referred to as developing the disease so rapidly was not cultivated.

Mr. SMITH. Last season we saw in a marked way the advantage of thorough cultivation.

The following (Query No. 3) was read:

"What is the remedy, if any, for borers in young peach trees while growing in the nursery?"

Mr. ENGLE. I have never found much trouble with borers in nursery rows.

Mr. HOOPES. We seldom have worms in nursery rows. If we find any when we dig the trees we destroy them. Plowing up to the young trees would likely be a preventive.

Mr. HOOPES. A few remarks on peach yellows. One attributes the cause to "frozen sap," another to lack of iron in the soil, others to light soils, etc. Recent experiments by Prof. Penhallow are developing some wonderful things, and will likely arrive at a true solution of the matter. It is settled now that it is a fungus, and, if so, there are two remedies which it is claimed will destroy this fungus.

Potash and lime are the remedies, but the trouble is to get these into the organism of the tree. Further experiments are now being made in this direction which will eventually lead to valuable results. It has been proven that orchards treated with lime and potash and then with barn yard manure, do well. I would like to hear from J. Hibberd Bartram on this subject.

Mr. **BARTRAM.** I have never used much stable manure as a fertilizer for peaches. During the last two or three years have used salt and lime, and don't think I have lost more than two trees by yellows. Last year I wormed and left open a lot of young peach trees and lost about one-third of them, owing no doubt to the exposure of the roots during the winter. One of my orchards is 13, one 7 and one 2 years old. Some of the large varieties have rotted badly. Crawford's Late is the most profitable variety. Smock, also, did well. Early varieties did not prove profitable.

Plums

Mr. **HOOPES.** We never had a better prospect for a crop of plums than the past season. We kept curculio off by jarring regularly, and when about ready to gather all rotted, even to the Damsons and Richlands. The rot appeared in the shape of little white specks, caused, no doubt, by fungus. We undertook spraying with lime water, and then potash, but to no purpose.

Cherries, Apricots and Quinces

were passed over without discussion.

Grapes

were next considered, and the following paper was read by Mr. Hiller, of Conestoga, Pa.:

Bagging grapes has been a great help in protecting the fruit from insects and birds, and to some extent in preventing mildew and rot. Just to what *profitable* extent bagging can be applied to prevent the great enemies of grape culture (mildew and rot) has not yet been fully demonstrated.

My experience (and that only as an amateur) is too limited to clear up the question. But as we meet to learn, as well as to impart knowledge, our little experiences put together may be productive of some definite information. If I were asked, shall we plant a vineyard in a locality in which the grape, even under good treatment, is a failure, and depend on bagging to make it a success? I would say don't do it. And yet under circumstances the answer might not be a good one. If the local market should afford a cent or two per pound extra we might, by planting varieties least liable to mildew, such as Telegraph, Moore's Early, Worden and Concord, and bag the fruit, realize paying profit. Grape culture in middle and eastern Pennsylvania is a reasonable success. An acre might contain six hundred and eighty vines, and these with eight pounds of grapes to the vine would produce nearly three tons of grapes. Estimating them at three cents a pound. they would amount to say one hundred and fifty dollars. To retain this narrow margin of profit and enjoyment, we must use our best endeavors to reduce the damage from insects, birds and mildew as much as possible.

My experience last summer with such ironclads as Telegraph, Moore's Early, Worden, Concord and Pocklington, did not, to the superficial observer, show a very great difference. They all ripened fairly well and were not much troubled with insects, etc. But when they were laid side by side, the bloom and brightness of the bagged fruit was so superior that they would readily have sold at an advance of one or two cents per pound. Then, too, the fruit that is not bagged, must be sent to market as soon as ripe; while that in bags can hang several weeks and still improve. As far as my experience went with ironclads last year, I would say, it pays to bag.

Then there is another class of grapes that are sometimes very superior, but just as often very poor. Among them might be mentioned Wilder, Barry, Lindley, Brighton, Prentiss, Duchess, and I think to this class we will have to put Niagara and Empire State. Most of these came out of the bags in fine condition, while those not bagged were mostly from medium to very poor. We might think that any varieties that are more uncertain than those last mentioned, should be discarded altogether. But when there are varieties so notably good in quality when well grown as are Jefferson and Triumph, the amateur will resort to all expedients to ripen them. These varieties in bags were quite good, while outside of bags there was not a berry fit to eat. In conclusion, I would say that to the amateur who delights in fine bunches of grapes, the bagging process is invaluable. And the question to be decided by the market grower who fails in producing paying crops, is whether he can profitably use the bags.

Col. McFARLAND. I notice that Mr. Hiller mentions "Telegraph." I have one hundred vines and never got a good crop.

President COOPER. For canning or jelly it is the best variety we have.

Mr. HILLER. With me Telegraph for a number of years has been very productive. I have but two vines, which are on a high trellis and in rich ground. We have a poor fruit market at Lancaster but can sell all our Telegraph at ten cents per pound.

Mr. ENGLE. Telegraph grows so compact on bunch that the berries sometimes burst and the bunches are not marketable. For hardiness would plant Ives' Seedling.

Mr. SNAVELY. I have about thirty vines of Talman, and it is my most profitable variety on account of its earliness. I have some thirty varieties in my vineyard and only about six are valuable, as follows: Talman, Moore's Early, Cottage, Telegraph, Worden and Clinton. Have had but little success with red grapes. Vergennes is a poor grower. Brighton grows well, but is a poor bearer. Hartford does reasonably well. Lady, too tender. For profit would plant Talman, Moore's Early, Telegraph, Concord and Wordon. Worden is my favorite. It is large, and as good as Concord. It makes as compact clusters as Concord, but larger bunches and berries. I think bagging pays all the time. For fertilizer we use bone and kainit. Barnyard manure causes too much wood growth. The object is to grow for fruit not for wood.

Mr. FULMER. In Allegheny county Concord does best, though thousands of vines of this variety have been dug up on account of rot. Moore's Early is also liable to rot. Brighton stands at the head for quality, and is equal to Concord for productiveness.

Mr. HILLER. I have bought a good many two-dollar vines and but few of them have proven of any value. First on the list I would place Moore's Early. It is all that can be desired, and I could not replace it. Would put Telegraph second, and Worden third. It is earlier and better than Concord. Concord fourth and Pocklington fifth. It is doing well, is very productive, large berries and of good quality. Have fruited Niagara one year. Think it must be bagged to get best results.

The PRESIDENT. We must consider location in these discussions; Mr.

Hiller has an elevated location and what will do well with him may not succeed with others.

Mr. BARTRAM. I would like to know what foreign varieties are best adapted to cold graperies. Probably Mr. Nelson could give us some information.

Mr. NELSON. In my opinion the best white grape for under glass is Alexander. Of black grapes Black Hamburg is the leading variety. Some grow only one main vine the entire length of the house, but best results are obtained by having two vines, one on each side, with upright laterals. Have seen vines one hundrd feet long trained in this way. Another plan is to have the plants outside of the house and protected by manure, allowing only the vines to run inside. I am at a loss to know the quantity usually grown to a square foot of glass.

Mr. HERR. Mr. Kready, of Mt. Joy, has over one hundred varieties fruiting and his own seedlings are best of all. He has some thirty seedlings, about a half dozen of which are very good. Among them are Keystone and Early Daisy, both of which have been several times exhibited before this society.

Raspberries and Blackberries.

Mr. SNAVELY. My red raspberry crop the past season was very fine. The Black Caps were a partial failure. Of red varieties Cuthbert has given the best satisfaction and proven most profitable. Brandywine does well. Early Prolific too soft, and Reliance not satisfactory. Have not tested Marlboro'.

Mr. MOON. Of the newer varieties, Rancocas has proven itself valuable, in fact, the best early red variety we have for our locality. Reports from other sections are similar. It is a much stronger grower and a little earlier than Hansell.

Mr. HERR. With me Rancocas has proved the poorest variety on the grounds. It is too soft and dark for a market berry.

Mr. ENGLE. Hansell is about as highly prized as any variety we have, being earliest on the list. We have felt like abandoning Black Caps, because Hansell is as early as any. For main crop Cuthbert is our standby. Marlboro' promises well, good grower, fine quality and size, and a decided acquisition. Shaffer's Colossal is hardy, vigorous and productive, and there is no raspberry equal to it for canning. Thwack has no special merit. Brandywine was very satisfactory until superseded by Cuthbert. Would confine my list to Hansell, Cuthbert, Shaffer's Colossal and Gregg. I treat the young shoots or sprouts as weeds, hoeing or pulling out all but a few canes wanted for next year's fruiting. Have discovered also that it is not the earliest or ripest canes that best withstand severe cold.

Mr. BARTRAM. Cuthbert is a most extraordinary grower, and I have found it necessary to trim it three times in a season. It ought to be planted four to five feet apart and three canes to a hill, to produce best crops. Would plant Marlboro and Cuthbert for main crop. Golden Queen is proving very satisfactory.

Col. McFARLAND. The raspberry was one of my best crops during the past year. First to ripen was Hansell. Marlboro' came in a day or two later, also have Cuthbert, Sonhegan, Ohio and Gregg. From the ripening of the earliest to the latest was one month and four days. Shaffer's Colossal does well, but is not a showy berry and is not popular in the markets for that reason. For family use it is preferred to any other, especially for canning or preserving.

Excursion to Cornwall.

Mr. Snavely. It has been proposed that if a sufficient number of members are disposed to go, an excursion be arranged for Friday morning to the Cornwall ore mines. In case we contemplate going some action should be taken now, so that the railroad officials may be notified and the necessary arrangements made.

Mr. Engle. While the trip would be a very enjoyable one, I fear the requisite number cannot be obtained to justify the running of a special train. Some of our members have already left, more will leave this evening, and most of those remaining have arranged to leave early to-morrow morning. I think, however, the best plan will be to submit the matter to the members present and see how many can go.

A vote having been taken, it was found that the requisite number could not be obtained, so the matter was indefinitely postponed.

On motion, further discussion of the General Fruit Committee's report was postponed until the evening session.

On motion of Mr. Rupp, the president was authorized to appoint a committee of three to represent this association at the coming annual meeting of the State Board of Agriculture.

President Cooper. I would suggest that some action be taken in reference to next biennial meeting of American Pomological Society which will be held in Florida in February next.

Mr. Engle. This promises to be an interesting meeting, and it will be well to appoint a committee to see what arrangements can be made for an excursion to Florida next winter.

The following from the "Query Box," on this subject was read by the Secretary.

"What action should this society take in reference to an excursion to Florida in February, 1889, to the biennial meeting of American Pomological Society?"

Mr. Engle. It is difficult, and too soon to take any positive action in this matter.

On motion, the president was authorized to name a committee of three to arrange a plan of procedure in this matter and report at our evening session.

The president appointed the following on said committee: J. C. Linville, H. M. Engle and E. B. Engle.

Colonel McFarland. Would it not be well to continue the committee on legislation. The Legislature is not in session this winter and no action has been taken by the present committee.

On motion the committee was continued.

On motion, adjourned.

EVENING SESSION.

Being called to order by the chair, the following was offered by Mr. Jamison:

"*Resolved*, That the peach growers of Pennsylvania ask our Committee on Legislation to urge the passage of an act similar to the one enacted in Michigan, in regard to the peach yellows."

Mr. JAMISON. I think the time has come when our Legislature should take some action in reference to yellows in this State. There is in force such a law in Michigan, and it is accomplishing great good. Experts are appointed to visit orchards and condemn trees affected by yellows.

All condemned trees must be promptly removed and destroyed and failure to do so is punished.

Mr. ENGLE. The law is similar in its provisions to those of some of our States in reference to Canada thistles.

The resolution was adopted as read.

The following committees were announced by the president:

On Auxiliary Societies.—Colonel George F. McFarland, E. B. Engle, H. S. Rupp, H. M. Engle.

On Arrangement for Next Annual Meeting.—W. M. Pannebaker, Henry Ort, J. E. Jamison, J. T. Smith, E. B. Engle.

Delegates to State Board of Agriculture.—Cyrus T. Fox, H. C. Snavely, H. S. Rupp.

On Legislation.—Dr. James Calder, George D. Stitzel, Josiah Hoopes, Colonel George F. McFarland, Hon. S. M. Wherry.

On Florida Excursion.—Calvin Cooper, chairman, Josiah Hoopes, George D. Stitzel, H. S. Rupp, E. W. Thomas, W. M. Pannebaker, Gabriel Hiester, J. E. Jamison, H. W. Fulmer, H. C. Snavely, E. B. Engle, secretary.

Distribution of Annual Reports.

President COOPER. I wish to call attention of this association to a suggestion made by our secretary in reference to the distribution of our annual reports. He proposes that the resolution passed several years ago requiring members to pay postage on reports be rescinded, and that all members be supplied henceforth free of charge. I think it would be a step in the right direction, and that the change should be made immediately.

Secretary ENGLE. I think this change would be for the best interests of our association and I hope it will be approved. While many of our members are prompt in sending the necessary postage for their reports, others are indifferent or forgetful, and according to the letter of our rules I have no authority to send them reports, although the annual fee of membership has been paid. I think, therefore, it would be best to authorize your secretary to supply the reports promptly as issued, at the expense of the society. They need not all be mailed, because where several members reside in the same town or city, or are in close proximity the report can be sent cheaper by express.

Mr. RUPP. I am in favor of the proposed change, and further I move that the secretary be authorized henceforth to supply all members with their annual reports free of expense.

Adopted.

The following essay was read by Mr. Moon.

HINTS ON ORNAMENTAL GARDENING.

By W. H. MOON, *Morrisville, Pa.*

Ornamental gardening, what is it? What are its uses and what its benefits? First, let us consider these points before going into the details. Ornamental gardening is not, in the common acceptation of the term, vegetable gardening, although under some circumstances that has a very practical ornamental taste about it. It is not farming, but it is an effort, an attempt or an accomplishment of both of these to make our homes, our possessions and their surroundings more attractive than they have been, or were, when we became possessed of them.

What is known as "Ornamental Gardening" strives to accomplish this by a judicious arrangement of trees, flowering shrubs and bedding plants, and a goodly share of nicely mown green sward; and by placing the walks and drives necessary for egress and ingress in graceful curves, so as to show the natural and acquired beauty of a lawn to the best advantage and at the same time to make the matter of convenience the greatest desideratum.

The general appearance of the landscape having undergone a constant change by the destruction of the primeval forests, it is but right and proper that every one should do something towards partially compensating for this loss and change. A portion of the ground in the immediate vicinity of dwellings can be made at least attractive by something that will beautify and increase their home-like appearance, as well as add to the comfort and happiness of the owners and their families. The judicious planting of trees and shrubs will help to accomplish these. To some there is more than this in ornamental gardening. To the man who is engulfed in mercantile pursuits there is that in an interest thus cultivated in horticulture and horticultural pursuits that acts as a panacea by diverting the mind from the constant strain of business and brings it into contact with nature, and may we not hope, with nature's God. There is also a refining, ennobling influence thrown around the young who may grow up in a home surrounded with these embellishments and are taught to become close observers of plant and vegetable growth. Thus we have striven to define the question as to what, and of what use, is ornamental gardening. Now we will attempt to give a few hints thereon:

In the first place, let me say to those who become possessed of an old place, with a fine assortment of large shade trees, prize them highly as something which have a value that it is hard to compute. Do not fail to have them judiciously pruned, and where they are too thick, dispose of the least desirable ones. The idea that it spoils large trees to have them pruned, or to have their large branches removed, is erroneous. They will be much more ornamental after two seasons' growth, and instead of that mild, ragged look, so common in large trees, they will have a much neater appearance. I especially emphasize this point, because so large a portion of the large deciduous trees we see would be much better by judicious pruning. With evergreens some varieties lose their symmetry and beauty with age, and no amount of pruning could ever restore their former beauty. The "Balm of Gilead," or balsam fir, is a striking example of this class.

If a lawn destitute of all trees, shrubs, etc., is to be laid out, then plant evergreen and deciduous trees and flowering shrubs, to gain the greatest effect and bring out the natural and artificial combined.

If your means be limited, then plant most of the trees of medium size. They can be had at much less cost, are more successfully transplanted, and you can enjoy the pleasure of seeing them grow and develop. There will be pleasant associations connected with each one, in training them up in the way they shall go. Again, if such unheard of advice can be assumed as disinterested in coming from a nursery-man, don't plant too thick, or don't plant them so near the dwelling that their branches will touch it in twenty or twenty-five years. This is important, and is frequently overlooked by many who do not fully realize the injury this may cause, or the prospective growth the young trees may make. A few fast growing deciduous trees are of great benefit to prevent the direct rays of the afternoon sun striking the house. The planting of choice long-lived varieties immediately back of these fast growers to be of sufficient size to accomplish this and admit of their removal after a few years when they become unsightly is a practice frequently adopted with fine effect. Among the leading deciduous trees, I would name for the guidance of those who are not informed on this matter, silver-leafed maple, Carolina and balsam poplar for fast growers; and of the medium and slow growing varieties of greater symmetry and beauty, Norway and sugar maple, European sycamore, American linden and American elm, magnolias and tulip trees and cut-leafed birch. The varieties especially adapted for damp ground, are the weeping-willow, swamp maple, white birch and alders. The weeping deciduous trees are: Kilmarnock willow, mountain ash, elm, poplar, cherry and lastly the new dogwood, all graceful and attractive.

The old fashioned way of planting shrubbery singly around the lawn is now much improved upon by forming large clumps or groups, thus combining color and effect and obtaining a succession of bloom from early spring until late autumn. The addition of ornamental grasses and a few rows of gladioli are a great help in making such a clump ornamental. Evergreen trees for single planting and hedging are a necessary addition to every lawn. Their beauty and attractiveness in winter, when the deciduous trees are leafless, is worthy of note, and a snow scene with a number of evergreens to contrast with its whiteness. is magnificent. For inside fencing I know of nothing better or more attractive than evergreen hedges. A few evergreens so planted as to break of the north-east wind from a dwelling is a great help to protect it from dampness. I am greatly encouraged by this meeting that in the near future ornamental gardening will receive more attention from every one. For a few packages of seeds of annuals, with some geraniums or other bedding plants, will serve as a beginning at a very slight outlay, and the pleasure of growing them for oneself will be very interesting, and will assist in the summer adornment of one's home.

Mr. RUPP. Has an one present had any experience with the new Weeping dogwood?

Mr. HEPLER. I have had one growing three years. It droops beautifully, and is a rapid grower. Branches thin, similar to Weeping willow.

Mr. LINVILLE. Much money is injudiciously spent in ornamental gardening, from a desire for new and expensive trees, plants and shrubbery. Unless we have plenty of room for variety and display, a few hundred dollars invested in well known and tested trees and shrubbery will give far greater satisfaction than thousands spent in new and rare importations and expensive novelties. We all know the pleasing effect of an old stone house overrun with ivies, mosses and lichens, and we should have more of them. Donald G. Mitchell says that the taste displayed by some persons in ornamental planting reminds him of a spinster of forty-five wearing the flowers and furbelows of a maiden of fifteen.

Mr. **Engle**. If no further discussion on this subject, we still have some unfinished business on hand. I believe we were discussing "raspberries and blackberries" when we adjourned.

President **Cooper**. The subject of "Small Fruits" was under discussion when we adjourned. Anything further on that subject will be in order.

Mr. **Fulmer**. I would like some information about Wilson, Jr., blackberry.

Mr. **Engle**. We have given it a trial and think well of it. It is a vigorous grower, berry large but not of best quality. Productive. Would however prefer Snyder to Wilson, Jr.

Strawberries.

Mr. **Brinton**. I consider the strawberry one of the most valuable small fruits we have, and every one should pay more attention to its cultivation. There is not one farmer in ten who grows sufficient for his own use. They are so easily raised that every one having a lot of ground can grow sufficient for family use.

Mr. **Engle**. Notwithstanding the fact that strawberries are among our most delicious fruits, and are as easily grown as potatoes, the laboring classes in our cities use more of them than four-fifths of our farmers. In almost any garden a rod or two of ground will yield plenty for the use of an ordinary family. During the last twenty-five years there has hardly been a day in strawberry season that they have not been on our table in some shape.

Mr. **Hiller**. It is true strawberries are easily started, but they need much attention to grow them successfully. They are easily overrun with weeds and in that condition will not amount to anything.

Mr. **Jamison**. I have never made the growing of strawberries a success. Hope some of our successful growers will give us information on the subject.

Mr. **Snavely**. I think I am safe in saying saying that the majority of farmers in Lebanon county grow strawberries. The first essential is thorough preparation of the soil. I prefer to plow sod in the summer, sow in oats, and turn down in the fall, applying a dressing of one thousand pounds of kainit per acre. The following spring, after thoroughly preparing and pulverizing the ground, the plants are set out. After planting, I give a dressing of six hundred to eight hundred pounds of ground bone per acre. In order to keep down weeds, and keep the plants growing properly, I keep the cultivator going all summer, and in the fall I have a good bed of plants for next season's fruiting. In the fall I cover lightly with manure for winter protection. In planting we check off rows three feet apart, and throw out a furrow six inches deep, pressing the plants against the land side of the furrow. Roots should be exposed as little as possible. We have about four acres, chiefly Sharpless.

Mr. **Lantz**. I am glad Mr. Snavely has told us how to grow strawberries successfully. We heard this morning of a gentleman who grew at the rate of six hundred bushels per acre, and sold some of his crop at twenty-five cents per quart. Such crops and prices must surely bring great profits.

Mr. **Snavely**. This is a rosy picture and is apt to mislead. While such results are possible they are the exception rather than the rule, and we must look at the other side as well.

President **Cooper**. Will some one state how to grow a crop of berries the first year, one objection is that we must wait until the second year for a crop.

Mr. **ENGLE.** It is possible to have a good crop the first year, but must have good, strong plants to set out in August or September. If you have plenty of plants and set them rather closely, almost a full crop may be obtained. If not set too closely, it is possible to raise the finest berries.

Query No. 5 was read by the President.—"Has any fruit grower had experience in sowing oats in strawberries for mulch?"

Mr. **HILLER.** I tried this one year, but did not think well of it.

Mr. **ENGLE.** When speaking of raising a good crop the first year I should have added a word in reference to potted plants. We have tried and found them very convenient for handling, easily transplanted and but little risk of failure. However, in starting new beds in close proximity to old ones, I find it about as satisfactory to trowel out plants with a ball of earth and carry them in boxes or baskets to where they are wanted. They start and grow about as readily as potted plants, and are less trouble and expense.

Mr. **LINVILLE.** The usual method of potting plants is to take two-inch pots, fill them with soil and place them in the ground near the plants from which the young runners are to be taken. When they begin to make roots the runners are placed into the pots, and in a few weeks they will become thoroughly established and can be transplanted without much risk. This method is very satisfactory for small plantings. For setting out plants, early spring is the best time. They are easily started before hot weather and drouth set in. Some plant pistillate varieties only and have imperfect berries. Staminate varieties should be planted with them. I was called in once by a neighbor whose plants had plenty of blossom but no berries, for the reason that he had no staminate plants.

Mr. **MOON.** I don't like to hear potted plants condemned without a word in their behalf. Many persons do not want to plant in spring, in fact are only ready to plant when they see the fruit. They do not wish to plant largely, and for such potted plants are most convenient and satisfactory. Planted in August or September, and given ordinary attention, they bear a good crop the following June.

Mr. **FULMER.** One of the most important points for beginners has been overlooked. That is, in planting to press the earth firmly to the roots. If this is observed, there is no trouble in getting plants to grow.

Mr. **HARRISON.** What is the best method of mulching for winter protection?

Mr. **COOPER.** Have found nothing better than rye straw.

Mr. **BRINTON.** This is liable to be blown off. Would use manure.

Mr. **BARTRAM.** Mr. Satterthwait uses salt hay.

Currants and Gooseberries.

Mr. **ENGLE.** Unless we can keep down the currant-worm, we may as well abandon these fruits at once.

Mr. **LINVILLE.** The currant-worm is easily managed, but the borer is more difficult to destroy. One or two applications of hellebore in water in a season will destroy the worm.

President **COOPER.** I have had no trouble in destroying the currant-worm. I use either Paris green or London purple in water, and applied with a fine force pump. They should be thoroughly sprayed as soon as the worms begin work, and in two or three weeks follow with a second spraying, which will be sufficient for the season. The application is easily and quickly made, and if done early in the season, there is no danger of poison.

Mr. **Fulmer**. We use "Hammond's slug shot," and find one application sufficient.

The following from the "Question Box" were read by the President:

Query No. 6.—"For persons who have no retarding houses, which is the best way to keep winter apples from the time of gathering until marketed?"

Mr. **Engle**. They may be kept in large bins or heaps in the orchards until barreled. After packing, they should be kept in as low and even a temperature as possible.

Query No. 7.—"What is the cause of Baldwin and some other winter apples dropping prematurely?"

Mr. **Jamison**. Because they have originated further north, and ripen too early here. York Imperial and Smith's Cider originated in Pennsylvania, and do not drop or ripen so early.

Query No. 8.—"What is the best spray for fruit trees, especially apple, and how can the Tent caterpillar best be destroyed?"

Query No. 9.—"How can can we kill the red spider in our green or hot houses?"

Mr. **Brinton**. I have offered this question and would like some information. I find this insect is also destructive to vegetation outside of hot houses. My evergreens are infested with it and I would be glad to hear a remedy. I have no trouble with the green fly or aphis.

Mr. **Hoopes**. The insect referred to is not red spider, but a red aphis, similar but more destructive than red spider. Red spider under glass cannot live in a moist atmosphere.

Mr. **Nelson**. My experience with red spider is similar to that of Mr. Hoopes. I use a small quantity of sulphur and keep the walks and paths moist and warm. Have no trouble keeping down the pest.

Mr. **Engle**. My experience coincides with that of Mr. Brinton. I notice the same insect on chestnut trees, and if not red spider it is so very similar as not to be distinguishable. I have found that any application that will destroy it will also kill the foliage.

President **Cooper**. It is now nine o'clock and there are still several topics on our printed list that have not been discussed. I will read them and the society can take up any they prefer.

First Topic.—"How can we counteract the effect of drought most effectually and economically?

Answered by Mr. Hiller in the following paper:

I have for years contended before this society that drought is the cause of more failures in the orchard than all other causes combined. In confirmation of this view I have shown that we can raise early summer apples about as well as we ever could, and that orchards situated on land so low as to be but a short remove from swamp, or on special soils and slopes that are not affected by drought are producing paying crops of fruit. But I repeat this only to show the importance of the question "How to counteract the effects of drought."

In potato culture we can with good plowing, good manuring and frequent and judicious cultivation, even in a season of minimum rainfall, produce fair crops. If we could treat orchards like our potato patches, manure and cultivate every year, we would have less cause to complain of drought. But when our orchards become well grown the whole ground becomes so filled with roots that it is no longer practicable to plow, and scarifying the surface often is the source of more harm than good.

Might we not greatly counteract the ill effects of drought by pruning? In our older orchards the bearing wood is often thirty feet from the source of sap. These bearing tops change very little from year to year. If by proper pruning these bushy tops had been formed twelve or fifteen feet from the ground the leaves would have less work to pump up the sap, and, besides, the orchardist would (since these tops are now within his reach) by pruning have some control in regulating the demand for sap, to the supplv. The art of giving trees this shape consists mainly in letting them alone when young. It may be necessary during summer to top off some of the leading branches.

Again. To counteract the effects of drought economically, is to utilize our rain-fall. Our principal rain-falls during summer come from thunder showers. In the majority of years they are frequent enough to prevent drought if the water could be absorbed by the earth as fast as it falls. But when a rain-fall of one or two inches occurs in a few minutes the surface becomes so compact that the greatest part of the water rushes down the hills, and in a day or two the orchard is in worse condition than before, for the moisture which did not penetrate the soil more than an inch or two is evaporated and the surface becomes compact and baked. By a little engineering we might utilize some of the waste water. By making two or three wide shallow basins a few feet from the trunk of the tree we could save all the water that falls in them, and by making a few ditches much of the water falling outside could be led in.

For small fruits deep plowing, cultivation and mulching are probably the only general available means of counteracting the effects of drought. The lay of our land is so irregular as to make irrigation by streams impracticable. True, in olden times when clover was not so well known or appreciated as now, every farmer who had a little stream had his meadow. In my young days these meadows were still abundant, but from the lay of the land they rarely exceed an acre or two. These old meadow sites might be used advantageously for growing fruit. It may be worthy of note that many of these meadow streams have a much smaller volume of water than formerly and some of them have disappeared.

Second topic.—Are antiseptics to be recommended for preserving fruits?

Mr. FOX. I rise to a question of privilege. During the past year several of our members have been called away by death, and I beg leave to offer the following:

Resolved, That this association deeply deplores the loss which it has sustained during the past year by the death of the following members: Jacob G. Zerr, James Koch and George W. Dauth, of Berks; J. S. Keller, of Schuylkill; J. E. Mitchell, of Philadelphia, and Dr. E. Michener, of Chester. We will cherish their memories as true friends of horticulture, and hope that others will be found to take the places made vacant in this association, and emulate their example in promoting the objects for which it was formed.

Adopted unanimously.

Mr. HOOPES. I rise to offer the following preamble and resolution.

Notwithstanding it may be an imperative duty which we feel called upon to perform, still in the present case it is undeniably one wherein we feel both willing and anxious to act, simply because the subject is beyond all precedent.

I, therefore, offer the following, which I feel to be totally inadequate as an expression of the views of our members:

WHEREAS, In view of the fact that at no previous meeting of this association has so fine a display of decorative plants and cut flowers been made, nor can we recollect a greater interest having been shown in our discussions than at the present time; therefore,

Resolved, That the thanks of this association be extended to the citizens of Lebanon for their cordial welcome and the decided interest taken in our deliberations; to Mrs. G. Dawson Coleman, for the generous loan of her green-house plants, and to her gardener, Mr. Louis Nelson, for the magnificent manner in which the plants and floral display were arranged; to Messrs. Wynings & Dace, the enterprising florists of Lebanon, for their unique floral designs; to Hon. C. R. Lantz and his efficient choir, for the excellent music rendered on Wednesday evening, and last, but not least, to our active fellow-mumber, Henry C. Snavely, for his interest in the objects of the association, and the excellent manner in which he fulfilled his duty as chairman of the Committee of Arrangements.

To this an amendment was added, on motion of Cyrus T. Fox, Esq., and accepted:

"That the thanks of this association be also tendered the press of the city of Lebanon for their kindly assistance and excellent reports of our proceedings."

The preamble and resolution, as amended, were unanimously adopted.

Third Topic.—"What trees are best adapted for highway planting in our State?"

Mr. HILLER. Where locust thrives it is the best and most profitable. Horse chestnut is not adapted to street planting. Paulonia is my pet, and is the best timber tree in the world.

Mr. BRINTON. What are the provisions of the law in this State in reference to street planting.

President COOPER. The compensation allowed is fifty cents per tree, but when planted the law forbids its removal, as it is the property of the Commonwealth. This feature is somewhat objectionable.

Fourth Topic.—"Can glass be dispensed with as a covering for hotbeds?"

Mr. RUTH. I have been growing tobacco plants under muslin with better success than glass.

Mr. ENGLE. We have tried oiled muslin and think well of it, but cannot entirely dispense with glass.

Mr. LINVILLE. Parties in New York offer a prepared muslin which is a good substitute for glass. It is cheap and easily handled.

Several additional topics were read but not discussed.

There being no further business the meeting was declared adjourned.

FRUIT LIST FOR PENNSYLVANIA, ARRANGED BY COUNTIES.

The following list of fruits is arranged and compiled in obedience to a resolution adopted at our annual meeting held at Bethlehem, Pa., January 19 and 20, 1887.

The original resolution contemplated only a list of apples but at the following annual meeting, held January, 1888, at Lebanon, the secretary was directed to continue the list from year to year, until he has secured a complete catalogue of varieties proving most desirable in every county in the State. The list is but a beginning, and will be revised and corrected from time to time, as later and more complete reports are obtainable. It might be well to add that in making the following selections, the widest latitude has been allowed in the list of varieties, and a number of correspondents have added some kinds that are unknown to the nurserymen, and have only a local name and reputation. If, instead of reporting by counties, the State could have been divided into five or six divisions of ten or twelve counties each, the lists could have been much abbreviated, though the result would not likely have been as satisfactory.

The following explanation will aid in a better understanding of the fruit lists. In the first or left hand column the number of varieties are given. The next column contains the names of varieties designated, given as nearly as possible in the order of preference. In the succeeding double columns, are given the figures showing the preferences of the counties as far as reported. In the report on apples, the first column gives the varieties preferred for market, the second, those preferred for family use. For instance, in the first county on the list (Adams), the figures as given, indicate that of summer varieties, "Benoni" is first choice, both for "market" and for family use. Early Harvest, second, Sweet Bough. third, Primate, fourth, etc. Under the same county, in "autumn varieties," the stars (*) given instead of figures, indicate that varieties were named, but no preference was given. Throughout the entire lists, it is understood where varieties are starred (*), it is to indicate that they were named, but that no first, second, or any other choice was made. Under Chester county, it will have been observed that while "Red Astrachan" is first choice of summer varieties for "market," it stands fifth for family use, while "Benoni," though first choice for "family," stands third, as a market apple. The distinction between varieties for "market" and "family" is confined to the list of apples only.

Apples. *Varieties Arranged in the Order of Preference.*	Adams.		Allegheny.		Armstrong.		Beaver.		Bedford.		Berks.	
	M.*	F.*	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,					1	2	2	4	1	1	2	2
2. Early Harvest,	2	2		3	3	5	1	1			1	1
3. Sweet Bough,	3	3		4	10	8	6	3	2	2		8
4. Summer Rambo,					2	1		5			4	8
5. Early Strawberry,					5	3	3	2				
Scattering votes.												
6. Duchess of Oldenberg,			4		4						7	9
7. Primate,	4	4	1	1						6		
8. Tetofsky,							7		5	5	3	4
9. Early Ripe,	5	5					4	6			8	6
10. Keswick Codlin,			3		6	6						
11. Townsend,							8					
12. Benoni,	1	1	2	2								
13. Am. Sum. Pearmain,												
14. Queen,									4	4	5	5
15. Summer Hagloe,					8	7						
16. Early Joe,					7	4			3	3		
17. Carolina Red June,					9	9	5				6	
18. Cornell's Fancy,												7
Autumn.												
1. Maiden's Blush,			2		1	3	4	4	1	1	3	2
2. Fall Pippin,				3	2	1	3	3			2	4
3. Smokehouse,					7	5	2	2	5	3	1	1
4. Rambo,		•	1	1	3	4	1	1			4	3
5. Gravenstein,					4	6					7	6
Scattering votes.												
6. Autumn Strawberry,					6	9	6	6				
7. Porter,	•	•		2		8					6	5
8. Jersey Sweet,			3						4	4		
9. Summer S. Paradise,											8	
10. Fameuse,												
11. Jefferis,									2	2	5	7
12. Fall Wine,					5	2	5	5				8
13. Hawley,												
14. Munson's Sweet,					9	7						
15. Golden Sweet,												
16. Sweet Rambo,					8				3	5		
Winter.												
1. Baldwin,	•	•	1	1	1	1	1	2	5	2	1	1
2. Northern Spy,			7	6	7	2	2	4			5	4
3. Rhode Island Greening,				4	8	12		5			9	9
4. Fallawater,		•			4	8	5	7			3	2
5. King,				8			7				7	5
6. Ben Davis,	•	•	8		10	5	6		6	6	10	10
7. Smith's Cider,		•			9	7			2	3	13	
8. Yellow Bellflower,				9			8	3	7	8		
9. Twenty Ounce,						14					11	12
10. Newtown Pippin,			2		9	6	9	6	8	7	14	
Scattering votes.												
11. Wagener,			8	3	6	11			3	9		8
12. York Imperial,	•	•							1	4	6	6
13. Golden Russet,			5	10	2	8	4	1			12	
14. Grimes' Golden,		•	4	2	3	10	10		4	1	8	3
15. Winesap,					5	13		9				
16. Hubbardston,	•	•	6	5		9					2	7
17. Gillflower,					11	4		8				
18. Seek-No-Further,							8	11				11
19. Dominie,		•										
20. Ewalt,												
21. Tolman's Sweet,												
22. Winter Sweet Paradise,						15		10				
23. Peck's Pleasant,	•			7								
24. Romo Beauty,												
25. Swaar,												
26. Long Island Russet,												
27. Carthouse (Romanite),									10	5		
28. Pennock,												
29. Roman Stem,												
30. Rawle's Janet,									9	10		
Crab Apples.												
1. Transcendent,			1	1	1	1			1	1		
2. Yellow Siberian,											3	3
3. Hyslop,			2	3	2	3			2	2	1	1
4. Red Siberian,						4			3	3	2	2
5. Montreal Beauty,			3	2		2						
6. Whitney's No. 20,												

*Market. *Family.

APPLES. *Varieties Arranged in the Order of Preference.*	Blair.		Bradford.		Bucks.		Butler.		Cambria.		Cameron.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	1	...	1	1	7	2	1	1	5	6	1	2
2. Early Harvest,	...	3	2	2	6	6	4	2	4	2	2	1
3. Sweet Bough,	4	...	3	3	3	...	...	...	6	5	...	5
4. Summer Rambo,	...	2	...	...	...	...	3	3	3	4	3	4
5. Early Strawberry,	...	4	...	...	...	...	...	4	2	3	...	3
Scattering votes.												
6. Duchess of Oldenberg,	...	1	4	4	...	...	5	5	...	...	4	...
7. Primate,	...	...	...	...	...	...	...	...	1	1	...	...
8. Tetofsky,	2	5	5	5	...	...	6	...	7	7	...	...
9. Early Ripe,	...	...	...	...	...	...	...	...	...	...	...	...
10. Keswick Codlin,	...	...	...	...	...	...	...	...	...	...	...	...
11. Townsend,	3	...	...	...	4	4	...	...	...	...	...	...
12. Benoni,	...	...	...	...	...	...	...	...	...	...	...	...
13. Am. Sum. Pearmain,	...	...	...	...	5	5	...	...	...	...	...	...
14. Queen,	...	...	...	...	...	...	...	...	...	...	...	...
15. Summer Hagloe,	...	...	...	...	1	1	...	...	...	...	...	...
16. Early Joe,	...	...	...	...	...	...	2	...	...	...	...	...
17. Carolina Red June,	...	...	...	...	...	...	...	...	...	...	...	...
18. Cornell's Fancy,	...	...	...	...	2	3	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	4	...	2	2	1	1	1	1	2	2	2	2
2. Fall Pippin,	2	...	1	1	6	3	2	5	1	1	1	1
3. Smokehouse,	5	...	9	...	5	6	...	...	4	5	...	...
4. Rambo,	...	1	3	4	4	5	...	7	6	3	3	3
5. Gravenstein,	3	...	5	7	2	2	...	...	3	4	...	...
Scattering votes.												
6. Autumn Strawberry,	...	...	4	3	...	...	...	...	5	...	...	...
7. Porter,	...	...	...	...	3	7	3	4	...	...	...	...
8. Jersey Sweet,	...	...	...	...	...	...	6	6	7	6	4	...
9. Summer S. Paradise,	6	...	...	...	...	...	5	8	...	...	...	...
10. Fameuse,	1	...	8	8	...	...	...	...	...	...	...	4
11. Jefferis,	...	...	...	...	...	4	...	...	...	...	...	...
12. Fall Wine,	...	...	7	6	...	...	4	3	...	...	...	...
13. Hawley,	...	...	6	5	...	...	...	...	...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	8	7	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	2	...	...	...	5
Winter.												
1. Baldwin,	1	1	1	3	3	2	2	1	1	1	2	...
2. Northern Spy,	6	...	4	1	...	...	1	4	2	2	3	1
3. Rhode Island Greening,	5	...	3	2	...	...	4	8	3	...	...	2
4. Fallawater,	3	6	...	...	6	...	7	5	...	...	...	3
5. King,	8	...	2	9	...	...	3	3	5	3	5	...
6. Ben Davis,	10	5	...	...	...	...	6	2	...	...	...	4
7. Smith's Cider,	...	...	...	...	1	1	...	...	14	13	...	...
8. Yellow Bellflower,	...	3	9	4	10	9	...	...	8	5	7	...
9. Twenty Ounce,	...	...	...	...	...	...	...	10	6	6	1	6
10. Newtown Pippin,	9	2	11	5	4	3	...	...	13	11	...	7
Scattering votes.												
11. Wagener,	...	...	6	10	...	...	...	...	11	10	6	...
12. York Imperial,	...	...	...	...	...	...	9	...	...	...	...	9
13. Golden Russet,	...	...	...	...	2	4	...	...	10	8	...	10
14. Grimes Golden,	4	...	...	...	...	...	11	11	7	7	...	...
15. Winesap,	...	...	...	11	11	8	8	9	...	...	...	...
16. Hubbardston,	...	...	...	...	5	6	...	...	...	...	...	...
17. Gillflower,	...	...	8	...	...	...	10	12	...	...	...	8
18. Seek-No-Further,	...	...	10	8	9	...	...	...	12	...	...	5
19. Dominie,	...	...	...	...	...	...	...	...	...	...	...	...
20. Ewalt,	2	...	...	...	...	...	...	...	4	4	...	...
21. Tolman's Sweet,	...	...	7	7	7	...	...	...	9	9	4	...
22. Winter Sweet Paradise,	...	...	...	...	...	...	...	6	...	12	...	...
23. Peck's Pleasant,	...	...	...	...	...	...	5	7	...	...	...	...
24. Rome Beauty,	7	4	...	...	8	5	...	...	...	...	...	...
25. Swaar,	...	...	5	6	...	...	...	...	...	...	...	...
26. Long Island Russet,	...	...	...	...	...	...	...	13	...	14	...	...
27. Carthouse (Romanite),	...	...	...	...	...	...	...	...	...	...	...	...
28. Pennock,	...	...	...	...	...	...	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	12	7	...	...	...	...	...	...
30. Rawle's Janet,	...	...	...	...	...	...	...	...	...	...	...	...
Crab Apples.												
1. Transcendent,	4	...	1	2	3	3	...	...	1	1	2	2
2. Yellow Siberian,	2	...	4	1	2	2	3	3	...	...	...	3
3. Hyslop,	3	2	...	...	1	1	...	...	...	...	...	...
4. Red Siberian,	5	1	3	...	4	4	1	1	...	...	1	1
5. Montreal Beauty,	1	...	...	...	...	...	...	...	2	2	...	...
6. Whitney's No. 20,	...	...	2	...	...	...	2	2	3	3	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Carbon.		Centre.		Chester.		Clarion.		Clearfield.		Clinton.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	2	1	1	1	1	5	3	3	1	3	2	5
2. Earley Harvest,	1	2	3	3	4	3	4	6	5	2	1	3
3. Sweet Bough.	4	4	2	2	...	8	6	4	3	8	3	4
4. Summer Rambo,	5	7	...	...	...	...	...	...	2	1	5	1
5. Early Strawberry,	8	8	6	6	...	...	1	2	...	...	8	...
Scattering votes.												
6. Duchess of Oldenberg,	3	3	5	7	7	...	...	...	4	4	...	6
7. Primate,	...	...	...	...	2	2	...	...	9	9	6	2
8. Tetofsky,	6	5	...	...	...	...	2	1	...	...	...	...
9. Earley Ripe,	...	...	4	4	...	...	...	...	...	...	...	...
10. Keswick Codlin,	...	...	...	...	...	...	...	...	...	...	9	...
11. Townsend,	7	6	...	...	9	...	...	...	7	7	...	...
12. Benoni,	...	...	7	5	3	1	...	5	6	6	10	...
13. Am. Sum. Pearmain,	...	...	...	...	6	6	...	...	...	...	4	...
14. Queen,	9	...	...	...	...	...	...	...	8	5	...	...
15. Summer Hagloe,	...	...	...	...	5	4	...	...	...	...	...	...
16. Early Joe,	...	...	8	8	...	7	5	...	...	...	7	...
17. Carolina Red June,	...	...	...	...	...	...	...	...	...	...	...	...
18. Cornell's Fancy,	...	...	...	...	8	...	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	1	1	3	1	3	5	...	...	5	1	3	1
2. Fall Pippin,	8	7	5	5	7	6	1	..	1	2	4	...
3. Smokehouse,	3	...	2	7	1	1	4	3	2	3	1	5
4. Rambo,	6	5	1	2	...	...	...	...	8	7	2	4
5. Gravenstein,	2	2	10	9	5	4	...	...	...	...	5	...
Scattering votes.												
6. Autumn Strawberry,	7	6	4	4	...	...	...	...	...	...	...	...
7. Porter,	...	...	8	3	2	3	3	4	7	6	6	2
8. Jersey Sweet,	4	3	...	...	...	...	2	1	3	4	...	...
9. Summer S. Paradise,	5	4	7	8	...	...	...	...	4	5	9	6
10. Fameuse,	...	...	9	10	6	...	...	...	...	...	7	3
11. Jefferis,	...	...	...	...	4	2	...	...	...	...	8	7
12. Fall Wine,	...	...	6	6	...	...	5	2	...	...	...	...
13. Hawley,	...	...	...	...	...	...	...	...	...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	6	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	6	...	...	...	...	8
Winter.												
1. Baldwin,	1	1	1	1	7	10	1	1	2	2	1	7
2. Northern Spy.	5	5	5	2	...	...	2	2	3	3	2	3
3. Rhode Island Greening,	6	6	10	9	...	...	3	8	6	4	8	8
4. Fallawater,	2	2	2	4	3	3	...	...	1	1	3	9
5. King,	4	4	8	8	...	...	10	7	...	...	...	6
6. Ben Davis,	...	...	...	...	4	5	9	6	...	...	4	2
7. Smith's Cider,	...	...	...	...	1	1	...	...	10	...	10	...
8. Yellow Bellflower,	3	3	3	3	...	...	...	...	...	...	7	1
9. Twenty Ounce,	...	...	7	7	...	...	...	...	8	...	...	...
10. Newtown Pippin,	...	...	4	5	5	9	...	...	...	...	...	...
Scattering votes.												
11. Wagener,	...	...	...	11	...	...	6	...	...	...	...	...
12. York Imperial,	...	...	...	...	2	2	...	...	9	...	...	...
13. Golden Russett,	7	8	...	...	...	...	...	...	4	5	...	...
14. Grimes' Golden,	...	...	9	...	10	11	...	...	5	8	6	4
15. Winesap,	...	...	...	...	8	6	7	9	...	...	...	...
16. Hubbardston,	...	...	12	...	6	8	...	...	...	7	...	...
17. Gillflower,	...	...	...	...	...	...	...	...	...	9	...	...
18. Seek-No-Further,	...	...	...	12	...	4	...	...	...	...	...	...
19. Dominie,	...	...	...	...	...	...	...	...	...	...	...	...
20. Ewalt,	...	7	6	6	...	...	...	...	7	...	5	5
21. Tolman's Sweet,	...	...	...	...	...	...	...	...	...	...	9	...
22. Winter Sweet Paradise,	...	...	11	10	...	...	5	5	...	6	...	...
23. Peck's Pleasant,	...	...	...	...	...	...	4	3	...	...	...	...
24. Rome Beauty,	...	...	...	...	...	...	8	4	...	...	...	...
25. Swaar,	...	...	...	...	...	...	...	...	...	...	...	...
26. Long Island Russet,	...	...	...	...	...	...	...	...	...	...	...	...
27. Carthouse (Romanite),	...	...	...	...	...	...	...	...	...	...	...	...
28. Pennock,	...	...	...	...	9	7	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	...	...	...	...	...	...	...	...
30. Rawle's Janet,	...	...	...	...	...	...	...	...	...	...	...	...
Crab Apples.												
1. Transcendent,	...	...	...	...	1	1	...	...	1	1	1	1
2. Yellow Siberian,	1	1	...	...	...	...	...	...	4	4	2	...
3. Hyslop,	...	...	...	...	2	2	...	...	2	2	4	2
4. Red Siberian,	3	3	...	...	...	...	...	...	3	3	3	...
5. Montreal Beauty,	...	...	...	...	...	...	...	...	...	...	...	3
6. Whitney's No. 20,	2	2	...	...	...	...	...	...	...	...	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Columbia.		Crawford.		Cumberland.		Dauphin.		Delaware.		Elk.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	2	2	1	1	1	2	1	1	4		1	1
2. Early Harvest,	5	5	6	2	4		8	5	1	1	3	2
3. Sweet Bough,			5	4			8	4		5	2	8
4. Summer Rambo,			8	7	5	4	2	2			4	8
5. Early Strawberry,			3	3								5
Scattering votes.												
6. Duchess of Oldenberg,	1	1	2	5			5	8			5	4
7. Primate,					7	5			3	3		
8. Tetofsky,			4	6			6	8			6	
9. Early Ripe,					2	1	7	7		2		
10. Keswick Codlin,	3	3			8	8	10	10				
11. Townsend,			7	8								
12. Benoni,					6	8	4	6				
13. Am. Sum. Pearmain,	4	4							5			
14. Queen,						7	9	9				
15. Summer Hagloe,					8	6			2	4		
16. Early Joe,												6
17. Carolina Red June,												
18. Cornell's Fancy,												
Autumn.												
1. Maiden's Blush,			2	2	2	3	8	6			6	5
2. Fall Pippin,			1	1	6	5	6	7			1	1
3. Smokehouse	5	5			3	2	1	1	2	2	4	
4. Rambo,			3	3	5	6	2	2			8	2
5. Gravenstein,	1	1			4		8	8	1	1	2	4
Scattering votes.												
6. Autumn Strawberry,	3	3	4	4							5	8
7. Porter,	4	4			1	1	4	5			8	8
8. Jersey Sweet,												
9. Summer S. Paradise,							7	8				6
10. Fameuse,			5	5								
11. Jefferis,					7	4	5	4	3	3	7	9
12. Fall Wine,												7
13. Hawley,	2	2										
14. Munson's Sweet,			6	6					4	4		
15. Golden Sweet,												
16. Sweet Rambo,												
Winter.												
1. Baldwin,	1	1	1	2	2	3	2	2			2	8
2. Northern Spy,	3	3	2	3							1	1
3. Rhode Island Greening,	2	2	8	1			9				7	8
4. Fallawater,	4	4		7	6	4	6				5	2
5. King,							10	8			4	6
6. Ben Davis,			5	9	4	6	8	8				
7. Smith's Cider,					5	7	4	7	*	*		
8. Yellow Bellflower,								6				
9. Twenty Ounce,			6	4							8	8
10. Newtown Pippin,												
Scattering votes.												
11. Wagener,			4	5							8	7
12. York Imperial,					1	2	1	1				
13. Golden Russet,			8									
14. Grimes' Golden,							8		*	*		
15. Winesap,					7	5	7		*	*		
16. Hubbardston,						8	5	9				
17. Gillflower,			7									
18. Seek-No-Further,				8							6	4
19. Dominie,					3	1		4				
20. Ewalt,									*			
21. Tolman's Sweet,				6								
22. Winter Sweet Paradise,								5				
23. Peck's Pleasant,										*		
24. Rome Beauty,	5	5										
25. Swaar,												
26. Long Island Russet,												
27. Carthouse (Romanite,)									*	*		
28. Pennock,										*		
29. Roman Stem,												
30. Rawle's Janet,												
Crab Apples.												
1. Transcendent,			2	2	1	1	1	1			4	2
2. Yellow Siberian,			3	3		3	3	2			2	1
3. Hyslop,			1	1	2	2	2				1	
4. Red Siberian,											3	3
5. Montreal Beauty,					3	4	4	3				
6. Whitney's No. 20,												

APPLES. *Varieties Arranged in the Order of Preferences.*	Erie.		Fayette.		Forest.		Franklin.		Fulton.		Greene.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	1	3	2	1	1	1	2	5	4	4	...	2
2. Early Harvest,	2	1	1	7	2	2	1	1	1	2	...	1
3. Sweet Bough,	...	2	3	3	...	...	3	3	...	...	...	...
4. Summer Rambo,	5	4	7	9	...	5	...	...	5	3	...	4
5. Early Strawberry,	4	5	6	6	3	3	7	6	...	...	...	...
Scattering votes.												
6. Duchess of Oldenburg,	...	...	...	...	...	...	...	...	...	...	...	...
7. Primate,	...	...	...	8	...	...	5	2	3	...	...	...
8. Tetofsky,	...	...	...	...	...	...	...	...	...	...	...	...
9. Early Ripe,	...	...	...	...	...	...	4	4	2	1	...	...
10. Keswick Codlin,	...	...	...	...	...	...	6	7	...	...	...	...
11. Townsend,	...	...	...	...	...	...	...	...	...	...	...	...
12. Benoni,	...	...	5	2	...	...	...	...	...	...	...	...
13. Am. Sum. Pearmain,	...	...	4	5	...	...	...	...	...	...	...	3
14. Queen,	...	...	...	...	...	...	...	...	...	...	...	...
15. Summer Hagloe,	...	...	...	4	...	...	...	...	...	...	...	...
16. Early Joe,	3	...	...	...	...	...	...	...	...	...	...	...
17. Carolina Red June,	...	...	...	...	...	4	8	8	...	...	...	5
18. Cornell's Fancy.	...	...	...	...	...	...	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	2	2	1	1	...	...	4	4	5	4	...	3
2. Fall Pippin,	1	1	2	2	3	1	6	6	1	...	...	5
3. Smokehouse,	5	4	3	4	...	...	1	2	3	2	...	1
4. Rambo,	4	5	...	3	2	2	2	1	2	1	...	2
5. Gravenstein,	3	3	...	...	...	...	5	5	...	...	...	...
Scattering votes.												
6. Autumn Strawberry,	...	...	...	...	1	3	...	...	...	...	...	...
7. Porter,	...	...	4	8	...	...	...	...	...	...	...	...
8. Jersey Sweet,	...	...	...	...	...	5	7	...	...	...	...	...
9. Summer S. Paradise,	...	...	...	5	...	6	...	...	4	3	...	...
10. Fameuse,	...	...	...	...	...	...	...	...	...	...	...	...
11. Jefferis,	...	...	...	...	...	...	3	3	...	...	...	...
12. Fall Wine,	...	...	5	7	...	4	...	...	...	...	...	4
13. Hawley,	...	...	...	...	...	...	...	...	...	...	...	...
14. Munson's Sweet,	...	...	...	6	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	6	...	...	...	...	...	...	...	...	...
Winter.												
1. Baldwin,	1	1	1	1	4	4	5	4	6	7	...	3
2. Northern Spy,	2	2	3	5	2	1	4	3	7	5	...	1
3. Rhode Island Greening,	3	5	5	3	3	5	9	5	...	...	...	6
4. Fallawater,	4	9	2	6	...	8	1	6	...	...	...	...
5. King.	5	3	...	...	1	3	...	12	...	...	...	...
6. Ben Davis,	...	...	...	...	...	2	...	...	5	6	...	...
7. Smith's Cider,	...	...	...	...	...	...	...	...	8	8	...	...
8. Yellow Bellflower,	...	...	...	...	6	10	10	...	...	...	...	2
9. Twenty Ounce,	9	10	...	...	...	...	...	...	4	4	...	...
10. Newtown Pippin,	...	8	...	...	...	7	3	7	...	...	...	5
Scattering votes.												
11. Wagener,	...	...	...	...	...	...	...	11	2	2	...	...
12. York Imperial	...	...	...	...	...	...	2	1	1	1	...	...
13. Golden Russet,	8	4	...	...	...	...	...	...	...	...	...	...
14. Grimes' Golden,	...	...	...	...	...	...	...	2	...	9	...	4
15. Winesap,	...	...	...	...	...	...	...	9	3	3	...	...
16. Hubbardston,	...	...	...	...	...	...	8	8	...	...	...	7
17. Gillflower,	7	6	...	...	5	6	...	...	...	...	...	...
18. Seek-No-Further,	10	...	6	7	...	...	...	...	...	...	...	...
19. Dominie,	...	...	...	...	...	9	7	10	...	...	...	...
20. Ewalt,	...	...	...	...	...	...	...	...	...	...	...	...
21. Tolman's Sweet,	...	7	...	...	...	...	...	...	...	...	...	...
22. Winter Sweet Paradise,	...	...	7	4	...	...	6	...	...	...	...	...
23. Peck's Pleasant,	...	...	...	...	...	...	...	...	...	...	...	...
24. Rome Beauty,	6	...	4	2	...	...	...	...	...	...	...	8
25. Swaar,	...	...	...	...	...	...	...	...	...	...	...	...
26. Long Island Russet,	...	...	...	...	...	...	...	...	...	...	...	...
27. Carthouse (Romanite,)	...	...	...	...	...	...	...	...	...	...	...	...
28. Pennock.	...	...	...	...	...	...	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	...	...	...	...	...	...	...	...
30. Rawle's Janet.	...	...	...	...	...	...	...	...	...	...	...	...
Crab Apples.												
1. Transcendent,	...	...	2	1	1	2	1	1	...	...	...	...
2. Yellow Siberian,	...	3	...	...	...	...	3	3	...	...	2	2
3. Hyslop,	1	1	...	...	2	1	4	2	...	...	...	3
4. Red Siberian,	...	2	1	2	...	...	2	...	...	...	1	1
5. Montreal Beauty,	...	...	...	...	...	...	...	...	...	...	...	...
6. Whitney's No. 20,	...	...	...	...	...	...	...	...	...	...	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Huntingdon.		Indiana.		Jefferson.		Juniata.		Lackawanna.		Lancaster.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	1	1	...	...	1	1	4	7	2	2	1	2
2. Early Harvest,	3	3	...	...	2	2	6	...	...	3	4	1
3. Sweet Bough,	...	...	2	2	...	5	2	5	...	4	...	9
4. Summer Rambo,	5	2	...	...	4	6	5	1	...	...	2	3
5. Early Strawberry,	...	...	...	...	6	7	...	...	3	...	8	7
Scattering votes.												
6. Duchess of Oldenberg,	...	...	3	...	3	3	...	...	...	...	6	10
7. Primate,	2	5	...	...	...	...	3	2	1	1	9	...
8. Tetofsky,	...	...	...	...	...	...	...	...	...	...	...	...
9. Early Ripe,	...	...	...	...	...	...	1	8	...	...	7	...
10. Keswick Codlin,	...	...	...	...	...	...	7	4	...	...	...	...
11. Townsend,	...	...	...	...	...	...	...	...	...	4	5	4
12. Benoni,	...	...	...	...	...	...	...	...	...	...	3	8
13. Am. Sum. Pearmain,	...	...	1	1	...	...	...	...	...	...	...	6
14. Green,	7	4	...	...	5	4	...	...	...	...	10	5
15. Summer Hagloe,	...	...	...	...	...	...	...	...	...	...	...	...
16. Earley Joe,	...	...	...	...	...	...	...	3	...	...	...	...
17. Carolina Red June,	4	...	...	...	...	...	...	6	...	...	...	...
18. Cornell's Fancy,	6	6	...	...	...	...	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	1	2	3	...	1	...	2	2	...	...	2	2
2. Fall Pippin,	6	6	...	4	4	...	...	...	3	3	8	8
3. Smokehouse,	2	1	...	...	7	...	3	6	4	4	1	1
4. Rambo,	5	3	...	...	...	...	6	8	...	...	6	3
5. Gravenstein,	...	...	1	1	9	...	5	5	...	...	4	5
Scattering votes.												
6. Autumn Strawberry,	...	...	...	...	2	...	...	10	...	...	...	...
7. Porter,	...	5	2	2	...	...	7	8	5	5	7	6
8. Jersey Sweet,	...	...	...	3	...	...	4	9	...	...	...	9
9. Summer S. Paradise,	...	...	...	...	6	...	...	...	...	...	9	7
10. Fameuse,	4	...	...	...	8	...	...	4	2	2	5	10
11. Jefferis,	3	4	...	...	...	...	1	1	...	...	3	4
12. Fall Wine,	...	...	...	...	3	...	...	...	...	...	...	...
13. Hawley,	...	...	...	...	5	...	...	...	...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	8	7	6	6	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	...	...	...	...	...
Winter.												
1. Baldwin,	5	12	1	1	1	1	2	1	...	...	3	3
2. Northern Spy,	2	3	4	6	2	2	5	4	1	2	...	...
3. Rhode Island Greening,	4	5	...	...	9	9	...	14	2	1	17	...
4. Fallawater,	...	8	2	2	3	3	4	2	...	...	6	4
5. King,	10	14	...	4	...	...	11	5	4	4	12	10
6. Ben Davis,	1	2	...	...	...	...	7	...	...	...	4	6
7. Smith's Cider,	14	10	...	...	13	13	3	9	...	...	2	1
8. Yellow Bellflower,	9	7	...	...	...	...	12	8	7	7	...	...
9. Twenty Ounce,	13	17	...	...	12	12	...	...	6	6	...	...
10. Newtown Pippin,	...	...	...	...	...	...	8	7	5	5	14	11
Scattering votes.												
11. Wagener,	...	...	...	...	5	8	...	...	...	...	13	...
12. York Imperial,	7	9	...	...	...	...	1	...	...	...	1	2
13. Golden Russet,	...	4	...	...	6	5	6	11	...	...	...	...
14. Grimes' Golden,	8	1	...	...	4	4	...	...	...	...	9	12
15. Winesap,	11	11	...	...	11	11	...	12	...	...	8	...
16. Hubbardston,	17	13	5	5	...	...	...	8	8	8	7	7
17. Gillflower,	...	...	3	3	7	7	...	...	9	9	...	...
18. Seek-No-Further,	6	...	...	...	10	10	...	...	8	8	16	...
19. Dominie,	16	15	...	...	...	...	13	6	...	...	5	5
20. Ewalt,	8	6	...	...	8	6	14	...	...	...	...	14
21. Tolman's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
22. Winter Sweet Paradise,	...	...	...	...	...	...	9	10	...	...	11	8
23. Peck's Pleasant,	...	...	...	7	...	...	...	...	...	...	...	...
24. Rome Beauty,	...	...	...	...	...	...	...	...	...	...	...	...
25. Swaar,	12	...	...	...	...	...	...	...	...	...	...	...
26. Long Island Russet,	...	...	...	...	...	...	10	...	...	...	...	...
27. Carthouse (Romanite),	...	...	...	...	...	...	...	13	...	...	10	13
28. Pennock,	15	16	...	...	...	...	...	...	...	...	15	9
29. Roman Stem,	...	...	...	...	...	...	...	...	...	...	...	...
30. Rawle's Janet,	...	...	...	...	...	...	...	...	...	...	...	...
Crab Apple.												
1. Transcendent,	...	...	...	...	1	2	1	1	1	2	1	1
2. Yellow Siberian,	3	3	3	...	4	3	3	3	...	...	2	3
3. Hyslop,	1	2	1	...	2	1	2	2	2	2	3	2
4. Red Siberian,	2	1	...	...	...	...	...	...	...	...	4	...
5. Montreal Beauty,	...	...	...	...	3	...	...	...	...	...	5	...
6. Whitney's No. 20,	...	...	...	...	...	...	...	...	...	...	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Lawrence.		Lebanon.		Lehigh.		Luzerne.		Lycoming.		McKean.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	1	1	2	2	...	1	1	1	2	...	...	...
2. Early Harvest,	3	7	...	...	...	6	2	2	1	...	...	1
3. Sweet Bough,	2	3	...	...	...	4	3	3	4	...	...	...
4. Summer Rambo,	4	4	3	3	...	...	...	...	...	...	...	...
5. Early Strawberry,	5	2	...	...	...	2	4	5	3	...	1	...
Scattering votes.												
6. Duchess of Oldenberg,	...	...	...	...	...	5	6	...	...	...	...	...
7. Primate,	...	...	...	...	...	...	5	4	...	...	...	...
8. Tetofsky,	...	...	...	...	...	3	...	...	...	...	...	...
9. Early Ripe,	...	...	1	1	...	...	...	...	...	...	...	...
10. Keswick Codlin,	6	8	...	...	...	...	...	...	...	...	...	...
11. Townsend,	...	...	...	...	...	...	...	...	...	...	...	...
12. Benoni,	...	...	...	...	...	...	...	...	...	...	...	...
13. Am. Sum. Pearmain,	...	...	...	...	...	...	...	...	...	...	...	...
14. Queen,	...	5	...	...	...	...	...	...	5	...	...	...
15. Summer Hagloe,	...	...	...	...	...	...	...	...	...	...	...	...
16. Early Joe,	...	6	...	...	...	...	...	...	...	...	...	...
17. Carolina Red June,	...	...	...	...	...	...	...	...	...	...	...	...
18. Cornell's Fancy,	...	...	...	...	...	...	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	2	5	2	2	2	2	5	...	...	...	...	...
2. Fall Pippin,	1	1	...	...	...	...	4	3	...	...	...	...
3. Smokehouse,	3	3	1	1	1	1	3	4	...	...	...	...
4. Rambo,	4	2	...	...	...	...	1	1	4	...	...	...
5. Gravenstein,	6	6	...	...	...	...	...	...	1	...	...	...
Scattering votes.												
6. Autumn Strawberry,	...	4	...	...	...	4	2	2	3	...	...	...
7. Porter,	5	...	...	...	...	...	...	...	2	...	...	...
8. Jersey Sweet,	...	7	...	...	...	...	6	5	...	...	...	...
9. Summer S. Paradise,	...	...	...	...	...	...	...	...	5	...	...	...
10. Fameuse,	...	...	...	...	3	3	...	...	...	...	...	...
11. Jefferis,	...	...	...	...	...	...	...	...	...	...	...	...
12. Fall Wine,	...	...	...	...	...	...	...	...	...	...	...	...
13. Hawley,	...	...	...	...	...	...	...	...	...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	...	...	...	...	...
Winter.												
1. Baldwin,	1	1	1	1	1	1	1	1	1	...	*	...
2. Northern Spy,	4	9	...	...	8	11	4	3	9	...	*	...
3. Rhode Island,	2	7	...	...	10	7	3	4	2	...	...	...
4. Fallawater,	5	8	6	7	2	2	5	7	4	...	...	...
5. King,	...	...	5	4	7	8	...	14	...	...	*	...
6. Ben Davis,	3	8	...	...	6	6	2	2	...	...	...	...
7. Smith's Cider,	...	...	3	5	5	5	10	10	...	...	...	...
8. Yellow Bellflower,	...	5	...	...	9	9	7	5	3	...	...	...
9. Twenty Ounce,	...	...	...	...	12	10	...	...	10	...	*	...
10. Newtown Pippin,	...	...	...	...	...	...	...	...	...	...	...	*
Scattering votes.												
11. Wagener,	...	11	8	...	11	13	11	11	6	...	...	...
12. York Imperial,	...	...	2	2	...	...	...	...	...	...	...	...
13. Golden Russet,	7	...	...	...	4	4	8	8	...	...	*	...
14. Grimes' Golden,	6	2	7	6	13	12	...	...	...	...	...	...
15. Winesap,	10	6	...	...	...	...	14	12	...	...	...	...
16. Hubbardston,	...	...	...	...	...	...	...	...	...	...	...	...
17. Gillflower,	...	...	...	...	...	...	6	6	...	...	...	...
18. Seek-No-Further,	...	10	...	...	...	...	12	...	8	...	...	...
19. Dominie,	...	...	...	...	...	...	...	...	...	...	...	...
20. Ewalt,	...	...	4	3	...	...	...	...	...	...	...	...
21. Tolman's Sweet,	8	4	...	...	...	...	13	9	...	...	...	...
22. Winter Sweet Paradise,	...	...	...	...	...	...	...	...	5	5	...	...
23. Peck's Pleasant,	...	...	...	...	...	...	...	...	...	...	...	...
24. Rome Beauty,	11	...	...	...	...	...	...	...	...	...	...	...
25. Swaar,	...	...	...	...	...	...	...	13	...	...	...	...
26. Long Island Russet,	...	...	...	...	...	...	...	...	7	...	...	*
27. Carthouse (Romanite),	...	...	...	...	...	...	...	...	...	...	...	...
28. Pennock,	...	...	...	...	14	...	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	...	...	...	...	...	...	...	...
30. Rawle's Janet,	9	...	...	...	...	...	9	15	...	...	...	...
Crab Apples.												
1. Transcendent,	3	2	...	...	...	...	1	1	1	...	...	...
2. Yellow Siberian,	1	1	...	...	1	1	...	...	...	...	*	...
3. Hyslop,	...	...	...	...	...	...	2	2	...	...	...	...
4. Red Siberian,	2	3	...	...	...	...	3	3	...	...	*	...
5. Montreal Beauty,	...	...	...	...	...	...	...	...	...	...	...	...
6. Whitney's No. 20,	...	...	...	...	...	...	...	...	...	...	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Mercer.		Mifflin.		Monroe.		Montgomery.		Montour.		Northampton.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	1	1	1	2	1	1	...	...	1	1	1	2
2. Early Harvest,	2	3	3	5	2	2	4	3	2	2	2	1
3. Sweet Bough,	4	2	...	...	3	3	...	...	5	...	...	...
4. Summer Rambo,	9	...	5	1	...	...	8	...	...	4	...	...
5. Early Strawberry,	6	9	...	...	4	5	...	...	...	...	...	...
Scattering votes.												
6. Duchess of Oldenberg,	3	4	...	...	...	...	5	5	3	3	3	...
7. Primate,	8	8	...	...	...	...	6	7	...	...	...	...
8. Tetofsky,	7	7	...	...	...	...	...	...	...	...	...	...
9. Early Ripe,	...	...	...	...	5	...	...	...	6	5	...	...
10. Keswick Codlin,	5	6	...	...	...	...	...	8	...	...	...	...
11. Townsend,	...	...	...	...	7	6	7	9	...	...	...	...
12. Benoni,	...	...	4	3	...	...	...	...	...	...	...	...
13. Am. Sum. Pearmain,	10	5	...	...	6	4	...	...	4	6	...	...
14. Queen,	11	10	2	4	...	...	...	...	...	...	...	...
15. Summer Hagloe,	12	11	...	...	...	...	3	4	...	...	...	...
16. Early Joe,	...	...	...	...	...	...	...	6	...	...	...	...
17. Carolina Red June,	...	...	...	...	...	...	...	...	...	...	...	...
18. Cornell's Fancy,	...	...	...	...	...	...	1	2	...	...	...	...
Autumn.												
1. Maiden's Blush,	1	1	1	1	1	3	6	3	...	...	1	...
2. Fall Pippin,	2	2	...	...	3	2	3	5	4	4	4	...
3. Smokehouse,	...	...	3	3	6	4	5	1	1	1	2	...
4. Rambo,	4	3	2	2	...	...	...	...	3	3	5	1
5. Gravenstein,	3	4	...	...	2	1	2	4	2	2	3	...
Scattering votes.												
6. Autumn Strawberry,	7	7	...	...	7	...	...	...	...	...	...	...
7. Porter,	...	...	4	4	...	...	1	2	...	...	...	...
8. Jersey Sweet,	5	6	...	...	5	...	...	...	5	5	...	...
9. Summer S. Paradise,	8	8	...	...	...	...	...	...	...	...	...	...
10. Fameuse,	9	9	...	...	4	5	...	...	...	...	...	...
11. Jefferis,	...	...	...	...	...	...	4	...	...	...	...	...
12. Fall Wine,	...	...	...	...	...	...	...	...	...	...	...	...
13. Hawley,	6	5	...	...	...	...	...	...	...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	...	...	...	...	...
Winter.												
1. Baldwin,	1	1	1	1	1	1	5	1	1	1	1	1
2. Northern Spy,	3	2	4	4	5	2	...	...	4	3	5	3
3. Rhode Island Greening,	4	5	8	8	2	4	2	...	6	6	...	...
4. Fallawater,	2	3	10	10	4	...	3	4	...	...	...	...
5. King,	5	7	...	...	7	3	...	...	2	5	...	...
6. Ben Davis,	10	12	...	...	8	...	4	5	...	...	...	...
7. Smith's Cider,	...	...	...	...	6	6	1	2	...	...	2	2
8. Yellow Bellflower,	7	13	...	...	3	8	...	...	3	2	...	...
9. Twenty Ounce,	...	...	...	...	...	7	...	8	13	...	...	...
10. Newtown Pippin,	...	...	...	...	9	5	...	...	...	...	...	...
Scattering votes.												
11. Wag-ner,	...	10	5	5	...	...	...	...	...	...	...	...
12. York Imperial,	...	...	2	2	...	...	6	3	...	...	3	...
13. Golden Russet,	...	...	...	...	10	9	...	...	11	8	...	...
14. Grimes' Golden,	...	...	...	...	...	...	...	...	...	...	6	...
15. Winesap,	...	...	...	...	...	...	...	7	...	...	...	...
16. Hubbardston,	...	...	...	...	...	10	7	6	...	...	4	...
17. Gilliflower,	...	14	...	...	...	...	...	...	9	9	...	...
18. Seek-No-Further,	8	6	...	...	...	...	...	...	5	4	...	...
19. Dominie,	6	4	7	7	...	...	...	...	...	...	...	...
20. Ewalt,	11	11	6	6	...	...	...	...	...	...	...	...
21. Tolman's Sweet,	...	...	...	...	...	...	...	...	8	13	...	...
22. Winter Sweet Paradise,	...	...	...	...	...	...	...	...	...	...	...	...
23. Peck's Pleasant,	9	8	...	...	...	...	...	...	7	7	...	...
24. Rome Beauty,	...	...	9	9	...	...	...	...	...	...	...	...
25. Swaar,	...	9	...	...	...	...	...	...	10	10	...	...
26. Long Island Russet,	...	...	3	3	...	...	...	...	12	11	...	...
27. Carthouse (Romanite),	...	...	...	...	...	...	...	...	14	12	...	...
28. Pennock,	...	...	...	...	...	...	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	...	...	...	9	...	...	...	...
30. Rawle's Janet,	...	...	...	...	...	...	...	...	...	...	...	...
Crab Apples.												
1. Transcendent,	3	3	...	1	1	1	1	1	...	...	...	...
2. Yellow Siberian,	...	...	...	3	3	2	...	...	...	...	...	...
3. Hyslop,	1	1	...	...	4	...	...	3	...	...	...	...
4. Red Siberian,	...	...	...	2	2	3	...	2	...	...	...	...
5. Montreal Beauty,	...	...	...	...	...	...	...	...	...	...	...	...
6. Whitney's No. 20,	2	2	...	...	...	...	...	...	...	...	...	...

Apples. *Varieties Arranged in the Order of Preference.*	Northumberland.		Perry.		Philadelphia.		Pike.		Potter.		Schuylkill.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	...	4	1	1	1	1	4	3	1	1	...	...
2. Early Harvest,	...	1	2	2	2	2	2	1	...	...	...	...
3. Sweet Bough,	...	3	...	5	4	...	...	5	4	3	...	...
4. Summer Rambo,	...	7	3	3	...	...	...	...	...	...	1	1
5. Early Strawberry,	...	6	...	...	...	4	5	6	3	4	...	...
Scattering votes.												
6. Duchess of Oldenberg,	...	...	5	...	3	3	1	*	2	5	...	...
7. Primate,	...	...	...	...	...	...	...	...	...	...	...	...
8. Tetofsky,	...	...	4	4	...	...	...	...	5	2	...	...
9. Early Ripe,	...	...	...	...	...	...	3	2	...	6	...	...
10. Keswick Codlin,	...	2	...	...	...	...	...	...	...	...	...	...
11. Townsend,	...	...	...	...	...	...	6	4	...	...	...	...
12. Benoni,	...	...	...	...	...	...	...	...	...	...	...	...
13. Am. Sum. Pearmain,	...	5	...	...	5	...	...	...	...	...	...	...
14. Queen,	...	...	6	...	...	...	*	...	...	...	...	...
15. Summer Hagloe,	...	8	...	6	...	...	...	...	...	...	...	...
16. Early Joe,	...	...	...	...	...	...	...	...	6	...	...	...
17. Carolina Red June,	...	...	...	...	...	...	...	...	...	...	...	...
18. Cornell's Fancy,	...	...	...	...	...	...	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	...	1	2	5	2	2	5	5	5	5	...	...
2. Fall Pippin,	...	...	4	3	4	4	1	1	...	...	...	...
3. Smokehouse,	...	2	1	1	3	3	...	...	6	4	...	...
4. Rambo,	...	3	3	2	...	...	...	...	7	7	...	...
5. Gravenstein,	...	...	6	...	1	1	...	...	...	...	...	...
Scattering votes.												
6. Autumn Strawberry,	...	...	5	4	...	...	2	2	3	6	...	...
7. Porter,	...	4	...	...	5	5	...	...	...	...	...	...
8. Jersey Sweet,	...	...	...	...	...	...	4	4	...	...	...	...
9. Summer S. Paradise,	...	...	8	6	...	...	...	...	4	3	...	...
10. Fameuse,	...	...	...	...	...	...	...	...	...	...	...	...
11. Jefferis,	...	...	7	...	...	...	...	...	...	...	...	...
12. Fall Wine,	...	...	9	...	...	...	3	3	2	2	...	...
13. Hawley,	...	...	...	...	...	...	...	...	1	1	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	...	...	...	...	...
Winter.												
1. Baldwin,	...	6	1	2	3	3	1	1	...	*	...	...
2. Northern Spy,	...	4	7	5	...	...	4	8	1	*	...	...
3. Rhode Island Greening,	...	2	2	10	...	...	...	5	4	*	...	...
4. Fallawater,	...	9	5	...	2	2	...	...	...	...	...	...
5. King,	...	...	...	...	5	5	3	6	3	*	...	...
6. Ben Davis,	...	7	6	4	6	6	...	...	...	...	...	...
7. Smith's Cider,	...	...	4	1	1	1	7	7	...	...	...	...
8. Yellow Bellflower,	...	5	...	...	...	...	2	3	...	*	...	...
9. Twenty Ounce,	...	...	11	11	...	...	...	9	...	*	...	...
10. Newtown Pippin,	...	...	...	...	...	...	...	2	...	...	...	...
Scattering votes.												
11. Wagener,	...	10	...	...	...	...	...	...	...	*	...	...
12. York Imperial,	...	3	3	6	7	7	...	...	...	...	...	...
13. Golden Russet,	...	1	...	...	...	...	...	...	...	*	...	...
14. Grimes' Golden,	...	...	8	3	...	...	6	...	...	...	...	...
15. Winesap,	...	...	...	...	8	8	...	...	...	...	...	...
16. Hubbardston,	...	...	...	9	4	4	...	...	...	...	...	...
17. Gillflower,	...	...	...	...	...	...	5	4	...	...	...	...
18. Seek-No-Further,	...	...	...	7	...	...	...	...	...	...	...	...
19. Dominie,	...	8	9	8	...	...	...	...	5	...	...	...
20. Ewalt,	...	...	...	...	...	...	8	10	...	...	...	...
21. Tolman's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
22. Winter Sweet Paradise,	...	...	10	12	...	...	...	11	...	...	...	...
23. Peck's Pleasant,	...	...	...	...	9	9	...	...	...	...	...	...
24. Rome Beauty,	...	...	...	...	...	...	...	...	...	...	...	...
25. Swaar,	...	...	...	...	...	...	...	...	...	*	...	...
26. Long Island Russet,	...	...	...	...	...	...	...	...	...	...	...	...
27. Carthouse (Romanite),	...	...	...	...	...	...	...	...	...	...	...	...
28. Pennock,	...	...	...	...	...	...	...	...	2	...	...	...
29. Roman Stem,	...	...	...	...	10	10	...	...	...	...	...	...
30. Rawle's Janet,	...	...	...	...	...	...	...	...	...	...	...	...
Crab Apples.												
1. Transcendent,	...	...	2	1	3	...	...	...	1	...	...	...
2. Yellow Siberian,	...	...	...	3	...	...	2	2	...	2	...	...
3. Hyslop,	...	...	1	...	...	...	...	...	...	...	...	...
4. Red Siberian,	...	...	...	...	2	2	1	1	1	...	...	...
5. Montreal Beauty,	...	...	3	2	1	1	...	...	...	...	...	...
6. Whitney's No. 20,	...	...	...	...	...	3	...	...	...	...	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Snyder.		Somerset.		Sullivan.		Susquehanna.		Tioga.		Union	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.												
1. Red Astrachan,	2	2	1	1	5	2	1	2	1	2	*	*
2. Early Harvest,	3	3	6	4	...	4	2	1	3	3	...	...
3. Sweet Bough,	7	7	...	...	8	5	3	3	5	4	...	...
4. Summer Rambo,	1	1	3	2	...	...	...	...	4	5	*	*
5. Early Strawberry,	...	...	...	...	...	1	5	8	2	1	...	...
Scattering votes.												
6. Duchess of Oldenburg,	4	4	2	...	1	3	6	7	6	6	...	...
7. Primate,	...	...	...	...	4	...	...	4	...	...	...	...
8. Tetofsky,	...	...	4	3	6	7	8	6	7	...	...	...
9. Early Ripe,	5	5	...	...	...	...	...	...	...	...	...	...
10. Keswick Codlin,	...	...	...	...	3	...	...	...	...	...	*	*
11. Townsend,	...	...	5	5	...	...	7	...	...	...	...	...
12. Benoni,	...	...	...	...	...	...	...	5	...	...	...	...
13. Am. Sum. Pearmain	...	...	...	...	...	6	4	9	...	...	...	...
14. Queen,	...	...	...	...	...	...	...	...	...	...	...	...
15. Summer Hagloe,	6	6	...	...	...	...	...	...	...	...	...	...
16. Early Joe,	...	...	...	...	7	...	...	...	...	...	...	...
17. Carolina Red June,	9	8	...	...	2	...	...	...	...	...	...	...
18. Cornell's Fancy,	8	9	...	...	...	...	...	...	...	...	...	...
Autumn.												
1. Maiden's Blush,	1	1	3	1	8	7	11	...	5	3	*	*
2. Fall Pippin,	4	5	2	5	1	1	1	1	6	1	...	...
3. Smokehouse,	2	2	1	2	2	3	10	...	8	...	*	*
4. Rambo,	3	3	4	3	3	4	9	8	3	2	...	...
5. Gravenstein,	...	...	...	4	...	9	2	5	2	...	...	...
Scattering votes.												
6. Autumn Strawberry,	5	4	5	...	5	...	3	2	1	4	...	*
7. Porter,	...	...	...	...	...	...	7	9	...	...	...	*
8. Jersey Sweet,	...	...	...	...	7	2	8	6	7	5	...	...
9. Summer S. Paradise,	...	...	...	...	6	...	12	10	...	...	...	...
10. Fameuse,	...	...	...	...	9	8	5	7	4	6	...	...
11. Jefferis,	...	...	...	...	4	5	...	...	...	...	...	*
12. Fall Wine,	6	6	...	...	...	6	4	3	...	...	...	...
13. Hawley,	...	...	...	...	...	...	6	4	...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	...	...	...	...	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	...	...	...	...	...
Winter.												
1. Baldwin,	1	1	1	3	1	1	1	1	5	4	*	*
2. Northern Spy,	4	5	3	7	6	2	4	4	2	3	...	...
3. Rhode Island Greening,	2	2	9	2	2	4	2	2	3	5	...	...
4. Fallawater,	3	3	8	11	4	...	6	11	...	...	...	...
5. King,	9	9	7	6	...	...	3	3	1	1	...	...
6. Ben Davis,	5	4	2	9	10	12	10	8	...	...	*	*
7. Smith's Cider,	12	12	5	8	12	13	...	...	...	...	...	...
8. Yellow Bellflower,	...	...	6	1	8	...	15	...	...	...	...	...
9. Twenty Ounce,	14	14	10	5	9	7	5	9	8	...	...	...
10. Newtown Pippin,	6	6	...	...	...	8	9	6	4	7	...	...
Scattering votes.												
11. Wagener,	...	...	...	...	...	10	14	13	7	6	...	...
12. York Imperial,	8	8	...	...	...	...	...	...	...	...	...	*
13. Golden Russet,	...	...	...	...	5	6	...	...	...	...	...	...
14. Grimes' Golden,	...	...	...	...	...	...	...	...	...	...	...	*
15. Winesap,	...	...	...	...	14	...	13	10	...	...	...	...
16. Hubbardston,	...	...	...	...	...	...	7	7	...	...	...	...
17. Gillflower,	...	...	...	...	3	3	11	...	...	2	...	...
18. Seek-No-Further,	...	...	...	10	13	5	...	...	...	...	...	...
19. Dominie,	...	...	...	...	...	...	...	...	...	...	*	*
20. Ewalt,	...	...	4	4	...	...	...	...	...	...	...	...
21. Tolman's Sweet,	...	...	...	...	7	...	8	5	...	...	...	...
22. Winter Sweet Paradise,	...	...	...	...	...	...	...	...	...	...	...	...
23. Peck's Pleasant,	10	10	...	...	...	...	...	...	...	...	...	...
24. Rome Beauty,	7	7	...	...	...	...	...	...	...	...	...	...
25. Swaar,	13	13	...	...	11	...	...	...	6	8	...	...
26. Long Island Russet,	...	...	...	...	...	9	12	12	...	...	...	...
27. Carthouse (Romanite),	11	11	...	...	...	...	...	...	...	...	...	...
28. Pennock,	...	...	...	...	...	...	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	...	...	...	...	...	...	...	...
30. Rawle's Janet,	...	...	...	...	...	11	...	...	...	...	...	...
Crab Apples.												
1. Transcendent,	1	1	...	...	...	...	...	...	1	1	...	...
2. Yellow Siberian,	3	3	1	1	1	1	...	...	...	...	...	...
3. Hyslop,	6	5	...	...	3	...	...	...	2	2	...	...
4. Red Siberian,	2	2	...	...	...	...	...	...	...	...	...	...
5. Montreal Beauty,	4	...	2	...	2	2	...	...	...	...	...	...
6. Whitney's No. 20,	5	4	...	...	4	...	...	...	...	...	...	...

APPLES. *Varieties Arranged in the Order of Preference.*	Venango.		Warren.		Washington.		Wayne.		Westmoreland.		Wyoming.		York.	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Summer.														
1. Red Astrachan,	1	1	1	1	1	1	1	1	2	3	1	1	2	2
2. Early Harvest,	2	2	4	3	2	2	5	3	1	1	2	2	3	3
3. Sweet Bough,	7	5	3	5	9	...	...	6	6	4	4	3	...	...
4. Summer Rambo,	5	3	7	...	10	...	...	...	4	6	...	7	5	5
5. Early Strawberry,	6	4	2	2	4	...	2	2	3	2	3	5	...	...
Scattering votes.														
6. Duchess of Oldenberg,	8	...	5	4	...	...	...	7	5	5	6	4	...	...
7. Primate,	...	...	...	...	6	6	...	...	...	...	...	...	1	1
8. Tetofsky,	...	...	6	...	8	5	...	...	7	7	5	6	...	...
9. Early Ripe,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10. Keswick Codlin,	...	...	...	...	3	3	3	4	9	10	...	...	...	...
11. Townsend,	3	7	...	...	...	...	...	8	...	...	7	9	...	...
12. Denoni,	9	...	...	...	...	...	...	...	...	...	...	8	4	4
13. Am. Sum. Pearmain,	4	6	...	...	...	...	...	...	...	...	...	...	...	...
14. Queen,	...	...	...	...	...	...	...	...	8	9	...	...	...	...
15. Summer Hagloe,	...	...	...	...	7	4	4	5	...	...	...	...	...	...
16. Early Joe,	...	...	...	...	5	...	...	...	...	8	...	...	...	...
17. Carolina Red June,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18. Cornell's Fancy,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Autumn.														
1. Maiden's Blush,	3	3	5	6	1	...	3	1	2	2	3	2	2	2
2. Fall Pippin.	1	2	1	1	2	1	5	5	3	3	1	1	5	5
3. Smokehouse,	...	...	...	...	6	...	...	...	5	4	6	...	1	1
4. Rambo,	5	1	...	...	7	2	7	4	1	1	2	4	...	...
5. Gravenstein,	6	...	2	3	4	...	1	8	4	...	...	...	4	3
Scattering votes.														
6. Autumn Strawberry,	2	7	6	2	3	...	4	3	7	8	5	3	...	...
7. Porter,	4	5	...	...	5	...	...	...	...	7	4	...	...	...
8. Jersey Sweet,	7	6	...	...	...	...	6	7	8	...	...	...	...	...
9. Summer S. Paradise,	...	...	...	7	...	...	...	...	6	6	...	...	...	...
10. Fameuse,	...	...	...	...	...	...	2	2	...	5	...	...	...	...
11. Jefferis,	...	...	...	...	...	...	...	...	...	...	...	...	3	4
12. Fall Wine,	...	4	...	...	...	...	...	...	...	...	...	...	...	...
13. Hawley,	...	...	3	4	...	...	...	...	...		...	...	...	...
14. Munson's Sweet,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15. Golden Sweet,	...	...	4	5	8	...	...	6	...	...	...	...	...	...
16. Sweet Rambo,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Winter.														
1. Baldwin,	2	4	2	3	1	1	1	3	1	1	1	1	1	1
2. Northern Spy,	1	2	1	1	5	3	5	9	3	2	9	6	10	...
3. Rhode Island Greening,	5	...	3	4	...	...	3	2	6	3	2	2	...	...
4. Fallawater,	6	...	10	...	2	2	11	8	5	5	5	10	6	6
5. King,	4	3	4	2	...	6	2	1	10	11	10	...	...	...
6. Ben Davis,	3	1	8	...	3	4	8	...	2	7	...	8	3	3
7. Smith's Cider,	...	...	...	...	6	...	6	5	...	...	4	7	5	5
8. Yellow Bellflower,	17	12	5	10	...	...	7	6	7	12	3	3	...	...
9. Twenty Ounce,	7	7	9	5	...	...	4	4	...	...	11	5	...	...
10. Newtown Pippin,	8	5	6	6	9	...	9	7	11	10	12	9	...	...
Scattering votes.														
11. Wagener,	16	11	...	...	7	5	...	...	...	...	15	12	...	10
12. York Imperial,	...	...	...	...	13	...	...	...	8	15	16	13	2	2
13. Golden Russet,	10	6	7	7	15	7	...	...	4	4	6	4	...	...
14. Grimes' Golden,	...	...	...	11	...	...	...	...	...	...	...	...	7	8
15. Winesap,	13	9	...	...	10	...	...	...	...	6	14	11	9	9
16. Hubbardston,	12	...	...	...	14	...	...	...	13	13	...	...	4	4
17. Gillflower,	9	13	...	8	...	...	12	10	...	...	7	15	...	...
18. Seek-No-Further,	...	...	...	...	...	...	...	...	9	16	8	...	...	...
19. Dominie,	15	10	...	...	...	...	...	...	...	...	...	...	8	7
20. Ewalt,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21. Tolman's Sweet,	...	...	11	9	12	...	...	...	...	...	13	16	...	...
22. Winter Sweet Paradise,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23. Peck's Pleasant,	14	8	...	...	11	...	...	...	...	14	...	14	...	...
24. Rome Beauty,	11	...	...	...	4	...	...	...	...	...	...	...	...	...
25. Swaar,	...	...	...	...	...	...	10	...	14	8	...	...	...	...
26. Long Island Russet,	18	...	...	...	...	...	...	11	...	...	...	...	...	...
27. Carthouse (Romanite),	...	...	...	...	...	...	...	...	...	17	...	...	...	...
28. Pennock,	...	...	...	...	...	...	13	...	...	...	...	...	...	...
29. Roman Stem,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
30. Rawle's Janet,	...	...	...	...	8	8	...	...	12	9	...	...	...	...
Crab Apples.														
1. Transcendent,	1	1	1	1	...	2	1	1	1	3	2	2	1	1
2. Yellow Siberian,	4	3	5	4	3	...	4	3	...	2	...	...	...	...
3. Hyslop,	...	...	4	5	...	...	...	...	2	...	1	1	2	2
4. Red Siberian,	3	2	2	2	1	3	2	2	...	1	3	...	3	3
5. Montreal Beauty,	2	4	3	3	...	...	...	...	...	...	...	...	...	...
6. Whitney's No. 20,	...	...	...	...	2	1	3	...	3	...	...	...	...	...

PEARS. *Varieties Arranged in the Order of Preference.*	Adams.	Allegheny.	Armstrong.	Beaver.	Bedford.	Berks.	Blair.	Bradford.	Bucks.	Butler.	Cambria.	Cameron.
EARLY.												
1. Bartlett,	1	2	1	1	1	1	1	1	1	...	...	...
2. Clapp's Favorite,	2	6	2	2	4	*	2	2	2	...	...	...
3. Osband's Summer,	5	...	4	...	...	3	...	3	5	...	...	...
4. Beurre Giffard,	...	1	3	3	...	6	...	7	3	...	...	...
5. Bloodgood,	6	5	6	...	...	*	...	6	...	...	...	...
Scattering votes.												
6. Doyenne d' Ete,	3	7	...	...	...	...	...	...	4	...	...	...
7. Manning's Elizabeth,	4	4	...	...	3	2	...	4	...	...	...	...
8. Brandywine,	...	...	5	...	...	...	...	...	...	...	...	...
9. Madeleine,	...	...	...	...	5	...	...	...	...	...	...	...
10. Dearborn's Seedling,	7	8	...	...	2	...	...	5	...	...	...	...
11. Maynard,	...	...	...	...	...	...	...	...	...	...	...	...
12. Rosteizer,	...	8	...	...	6	4	...	...	...	...	...	...
13. Hosenshenk,	...	...	...	...	...	5	...	...	...	...	...	...
MEDIUM.												
1. Seckel,	1	8	1	1	1	5	1	2	...	...	...	...
2. B. de Anjou,	3	1	...	2	4	6	...	1	3	...	...	...
3. Flemish Beauty,	...	9	4	...	...		...	4	...	...	...	...
4. Duchess,	5	4	2	3	...	2	...	3	...	...	...	...
5. Sheldon,	...	6	6	...	5	...	...	5	...	...	...	...
Scattering votes.												
6. Kieffer,	4	2	7	...	...	4	...	...	1	...	...	...
7. Louis Bonne,	...	...	...	4	...	1	...	6	...	...	...	...
8. Howell,	2	7	5	...	3	...	...	...	...	...	...	...
9. Buffum,	...	5	...	...	6	...	...	...	...	...	...	...
10. B. Clairgeau,	6	...	3	...	7	3	...	7	...	...	...	...
11. Belle Lucrative,	...	...	...	...	...	...	...	...	...	...	...	...
12. B. Bosc,	...	3	...	...	2	...	...	...	4	...	...	...
13. Rutter,	...	...	...	...	...	...	...	...	2	...	...	...
14. Prest. Clapp,	...	...	...	...	...	...	...	...	...	...	...	...
15. Doy Boussock,	...	...	8	...	...	...	...	...	...	...	...	...
16. White Doyenne,	...	...	...	...	...	7	...	...	...	...	...	...
17. Le Conte,	...	...	...	...	...	8	...	...	...	...	...	...
LATE.												
1. Lawrence,	1	1	4	...	1	1	1	1	1	...	...	...
2. Vicar of Winkfield,	...	4	2	...	2	4	...	4	...	...	...	...
3. Winter Nelis,	...	3	1	...	6	...	...	3	2	...	...	...
4. Dana's Hovey,	*	...	3	...	5	3	...	...	...	...	...	...
5. E. Beurre,	...	...	...	...	3	2	...	2	...	...	...	...
Scattering votes.												
6. Glout Morceau,	...	...	...	...	4	...	...	...	...	...	...	...
7. Prest. Drouard,	2	2	...	...	...	...	...	5	...	...	...	...
8. Jones,	...	...	...	...	...	...	...	...	...	...	...	...
9. Duchess 'd Bordeaux,	...	...	...	...	...	...	...	...	...	...	...	...
Cherries.												
HEARTS AND BIGARREAUS.												
1. Black Tartarian,	2	2	3	1	1	1	1	5	...	...	...	...
2. Governor Wood,	1	1	2	2	...	2	...	2	1	...	...	...
3. Napoleon,	4	4	...	...	...	*	...	1	...	...	...	...
4. Yellow Spanish,	5	6	1	3	2	...	...	6	2	...	...	...
5. Black Eagle,	*	...	5	...	...	6	...	...	4	...	...	...
Scattering votes.												
6. Ohio Beauty,	*	...	7	...	...	...	...	...	...	...	...	...
7. Early Purple Guigne,	3	3	...	...	3	3	...	...	...	...	...	...
8. Cumberland Triumph,	*	...	...	...	...	...	...	...	...	...	...	...
9. Knight's Early Black,	...	...	...	...	...	5	...	...	...	...	...	...
10. Downer's Late,	...	...	...	...	...	*	...	4	...	...	...	...
11. Tradescant's Black Heart,	...	5	6	...	...	7	...	...	...	...	...	...
12. Coe's Transparent,	...	...	...	...	...	...	...	3	3	...	...	...
13. Big. de Mezel,	...	...	...	...	...	4	...	...	...	...	...	...
14. Elton,	...	...	4	...	...	...	...	...	...	...	...	...
15. Cocklin's Favorite,	*	...	...	...	...	8	...	...	...	...	...	...
16. Conestoga,	...	...	...	...	...	...	...	...	...	...	...	...
17. Rockport Bigarreau,	...	...	...	...	...	...	...	...	...	...	...	...
DUKES AND MORELLOS.												
1. Early Richmond,	1	5	2	*	1	1	...	1	1	...	...	...
2. May Duke,	2	1	1	*	2	2	1	3	2	...	...	...
3. English Morello,	...	...	5	...	5	5	2	5	3	...	...	...
4. Montmorency,	3	3	3	...	...	*	...	2	...	...	...	...
5. Reine Hortense,	...	2	...	...	3	*	...	...	5	...	...	...
Scattering votes.												
6. Late Duke,	...	7	4	*	4	3	...	4	...	...	...	...
7. Olivet,	4	...	6	...	...	...	...	...	...	...	...	...
8. Carnation,	...	...	...	...	6	4	...	...	...	...	...	...
9. Belle 'd Magnifique,	5	6	7	...	...	...	...	...	...	...	...	...
10. Belle 'd Choisy,	...	4	...	...	7	*	...	...	4	...	...	...

PEARS. *Varieties Arranged in the Order of Preference.*	Carbon.	Centre.	Chester.	Clarion.	Clearfield.	Clinton.	Columbia.	Crawford.	Cumberland.	Dauphin.	Delaware.	Elk.
EARLY.												
1. Bartlett,	*	1	1			1		1	1	1		1
2. Clapp's Favorite,	*	2	2			2		2	2	2	2	3
3. Osband's Summer,		3				3		5	4	5	3	*
4. Beurre Giffard,			6			6		3	3			
5. Bloodgood,			5							3		
Scattering votes.												
6. Doyenne d'Ete,			3			4			5			
7. Manning's Elizabeth,						5						
8. Brandywine,			4							4		
9. Madeleine,		4	9					4			4	*
10. Dearborn's Seedling,												
11. Maynard,			7									2
12. Rosteizer,											1	
13. Hosenshenk,			8									*
MEDIUM.												
1. Seckel,		1	2			3		4	3		1	
2. B. de Anjou,	*	2	3			7		3	2		3	
3. Flemish Beauty,		3				1		2	7	2		3
4. Duchess,	*	7				2			5			1
5. Sheldon,	*		8			4		1		3		*
Scattering votes.												
6. Kieffer,		4	1					5	1			
7. Louis Bonne,			6			5		6				4
8. Howell,			4			6				5	2	
9. Buffum,						8			6	4		2
10. B. Clairgeau,		5	9					8	4			
11. Belle Lucrative,			10							1		
12. B. Bosc,		6										
13. Rutter,			5									
14. Prest. Clapp,												
15. Doy Boussock,											4	
16. White Doyenne,								7				
17. Le Conte,			7									
LATE.												
1. Lawrence.			1			1		1	3	1	1	1
2. Vicar of Winkfield,		1	2			2		3	1		2	2
3. Winter Nelis,								2	2			
4. Dana's Hovey,		2										
5. E. Beurre,	*	3							4			
Scattering votes.												
6. Glout Morceau,			3						5			
7. Prest. Drouard,												
8. Jones,												
9. Duchess 'd Bordeaux,												
Cherries.												
HEARTS AND BIGGARREAUS.												
1. Black Tartarian,		1	4						1	3		2
2. Governor Wood,		2	2						2	1	2	
3. Napoleon,			1						4	2	3	1
4. Yellow Spanish,										4	1	
5. Black Eagle,			5									3
Scattering votes.												
6. Ohio Beauty,		3	6									4
7. Early Purple Guigne,												
8. Cumberland Triumph,									3	5		
9. Knight's Early Black,												*
10. Downer's Late.												
11. Tradescant's Black Heart,												5
12. Coe's Transparent,												
13. Big. de Mezel,			3									
14. Elton,			7									
15. Cocklin's Favorite,												*
16. Conestoga,												
17. Rockport Bigarreau,		4										
DUKES AND MORELLOS.												
1. Early Richmond,		1	1					1	1	1	1	
2. May Duke,	*		4					2	4	2	2	2
3. English Morello,		2	2						2		3	
4. Montmorency,	*		3					3				1
5. Reine Hortense,			5						5			
Scattering votes.												
6. Late Duke,								4		3		3
7. Olivet,	*											
8. Carnation,			6					5				
9. Belle 'd Magnifique,	*	3										
10. Belle 'd Choisy,									3			

PEARS. *Varieties Arranged in the Order of Preference.*	Erie.	Fayette.	Forest.	Franklin.	Fulton.	Greene.	Huntingdon.	Indiana.	Jefferson.	Juniata.	Lackawanna.	Lancaster.	Lawrence.	Lebanon.
EARLY.														
1. Bartlett,		1		1	1		1		1	1	1	1	1	2
2. Clapp's Favorite,		2		3	2		3		5	2	2	2	2	1
3. Osband's Summer,				4			4		2	4		8		3
4. Beurre Giffard,				2			6		8			4		
5. Bloodgood,							5		3	7		6		
Scattering votes.														
6. Doyenne d' Ete,				5	3					6				
7. Manning's Elizabeth,					4							7		
8. Brandywine,							2					9	3	
9. Madeleine,		3							4	3				
10. Dearborn's Seedling,				6										
11. Maynard,									6			5		
12. Rosteizer,										5				
13. Hosenshenk,									7			3		
MEDIUM.														
1. Seckel,		3		1	1		1		3	1	3	3	7	3
2. B. de Anjou,		1		4			2		2			2	2	6
3. Flemish Beauty,					3		4		1	2	4	7	5	*
4. Duchess,				3			3		8			5	6	2
5. Sheldon,				5			5		4	3	2	1	9	1
Scattering votes.														
6. Kieffer.		5		2	2							6	1	
7. Louis Bonne,		4					6		5	4				
8. Howell,					5					5		4	4	
9. Buffum,		2			4				7					
10. B. Clairgeau,														
11. Belle Lucrative,													8	4
12. B. Bosc,											1			
13. Rutter,									9					5
14. Prest. Clapp,														
15. Doy Roussock,													3	
16. White Doyenne,									6					
17. Le Conte,														
LATE.														
1. Lawrence,				1			3		2	1		1	1	1
2. Vicar of Winkfield,				3			2			2		3	3	2
3. Winter Nelis,		1		2			5		3	3	1	4		
4. Dana's Hovey,							4		1			2		
5. E. Beurre,,							6			4		5		
Scattering votes.														
6. Glout Morceau,							1		4				2	
7. Prest. Drouard,									5			6		
8. Jones,														
9. Duchess 'd Bordeax,														
Cherries.														
HEARTS AND BIGARREAUS.														
1. Black Tartarian,		1		1	1		1		5	3		4	1	*
2. Governor Wood,				3	2		2		4	1		2	2	1
3. Napoleon,				2	3				2			10		
4. Yellow Spanish,				5			4			4		5	3	*
5. Black Eagle,									1			6		
Scattering votes.														
6. Ohio Beauty,		3			4		5		7	6				
7. Early Purple Guigne,		4		4					3	2		9		
8. Cumberland Triumph,					5		3					3		
9. Knight's Early Black,				6			6		8	8			4	
10. Downer's Late,		2								5		8		
11. Tradescant's Black Heart,									10					
12. Coe's Transparent,							7							
13. Big. de Mezel,									6	7				
14. Elton,							8			9				
15. Cocklin's Favorite,														
16. Conestoga,									9			1		
17. Rockport Bigarreau,												7		
DUKES AND MORELLOS.														
1. Early Richmond,		1		1	1	1	1	4	4	1	1	1	1	1
2. May Duke,		2		3	3		2		2	2	2	2	5	4
3. English Morello,					2		4		9	5		3	4	
4. Montmorency,							7		1	3		8	2	
5. Reine Hortense,		4					3		10	6		5	3	3
Scattering votes.														
6. Late Duke,							5		3	7		6	6	
7. Olivet,					4		6		6	4		9		
8. Carnation,		3		2					5			7		
9. Belle 'd Magnifique,		5							7					2
10. Belle 'd Choisy,									8			4		

PEARS. *Varieties Arranged in the Order of Preference.*	Lehigh.	Luzerne.	Lycoming.	McKean.	Mercer.	Mifflin.	Monroe.	Montgomery.	Montour.	Northampton.	Northumberland.	Perry.	Philadelphia.	Pike.
EARLY.														
1. **Bartlett,**	1	1			2		1	1	1	1		1	1	1
2. **Clapp's Favorite,**	4	2			1		2	4	3	3		3	2	2
3. **Osband's Summer,**		4			4				2	5			5	4
4. **Beurre Giffard,**	3	5						5					3	5
5. **Bloodgood,**								6				*		
Scattering votes.														
6. **Doyenne d' Ete,**		3			5			2				2		3
7. **Manning's Elizabeth,**	6								4	4				
8. **Brandywine,**	5												4	
9. **Madeleine,**					3									
10. **Dearborn's Seedling,**	8							3						
11. **Maynard,**	2								5	2		5		
12. **Rosteizer,**														
13. **Hosenshenk,**	7											4		
MEDIUM.														
1. **Seckel,**	4	1			4		1	1	3	6		1	1	1
2. **B. de Anjou,**	2	4			5		2	6		1				
3. **Flemish Beauty,**	8				1		5		1	7		5		2
4. **Duchess,**	5	3			3				2	3		2		
5. **Sheldon,**	1	5					4	4					2	4
Scattering votes.														
6. **Kieffer,**		2					3	5		2			4	
7. **Louis Bonne,**	3	7			2							6		3
8. **Howell,**	6							7				7	3	
9. **Buffum,**		8										3		
10. **B. Clairgeau,**	7													
11. **Belle Lucrative,**										5		4		5
12. **B. Bosc,**										4				
13. **Rutter,**								3					5	
14. **Prest. Clapp,**							6		4					
15. **Doy Boussock,**								2						
16. **White Doyenne,**		6								8				
17. **Le Conte,**														
LATE.														
1. **Lawrence,**	2	1			3		*	1	2	1		1	1	1
2. **Vicar of Winkfield,**	1				4			2	1	3		2	4	3
3. **Winter Nelis,**	3	2			1			5		4				2
4. **Dana's Hovey,**					5		* *	4		2		*	3	
5. **E. Buerre,**	5							3						
Scattering votes.														
6. **Glout Morceau,**														
7. **Prest. Drouard,**		3			2									
8. **Jones,**													2	
9. **Duchess' d Bordeaux,**	4													
Cherries.														
BEARTS AND BIGARREAUS.														
1. **Black Tartarian,**	4	2			1		*	5				5	2	4
2. **Govenor Wood,**	1	3			2			3		2		1	1	3
3. **Napoleon,**	2	*						4		5			3	
4. **Yellow Spanish,**	3	1										4	5	5
5. **Black Eagle,**	5	*						2		3		*		2
Scattering votes.														
6. **Ohio Beauty,**									3	1		*		
7. **Early Purple Guigne,**													4	
8. **Cumberland Triumph,**							1					6		
9. **Knight's Early Black,**									2					
10. **Downer's Late,**							*	1				*		
11. **Tradescant's Black Heart,**	6													
12. **Coe's Transparent,**														1
13. **Big. de Mezel,**							2					3		
14. **Elton,**		*							1			*		
15. **Cocklin's Favorite,**												2		
16. **Conestoga,**										4		7		
17. **Rockport Bigarreau,**														
DUKES AND MORELLOS.														
1. **Early Richmond,**	1	2			1		1	1	2	1		1	1	2
2. **May Duke,**	3	1			5			3	1	3		2	2	1
3. **English Morello,**	2				3		2		3	4		*	3	3
4. **Montmorency,**	4	*										5		
5. **Reine Hortense,**		*						5						5
Scattering votes.														
6. **Late Duke,**								2					4	
7. **Olivet,**	5	*			2									
8. **Carnation,**	6							4		2		3	5	
9. **Belle'd Magnifique,**	7											4		4
10. **Belle 'd Choisy,**					4				4			*		

PEARS. *Varieties Arranged in the Order of Preference.*	Potter.	Schuylkill.	Snyder.	Somerset.	Sullivan.	Susquehanna.	Tioga.	Union.	Venango.	Warren.	Washington.	Wayne.	Westmoreland.	Wyoming.	York.
EARLY.															
1. Bartlett,			2	1	2	1	1			1	1	1	1	1	
2. Clapp's Favorite,			1		1	2	2			2	2	2	2	2	
3. Osband's Summer,			4		5	4							4		
4. Beurre Giffard,															
5. Bloodgood,					4	3				6	3	3			
Scattering votes.															
6. Doyenne d' Ete,										5		5	3		
7. Manning's Elizabeth,			3		3										
8. Brandywine,				2						4	5				
9. Madeleine,											4				
10. Dearborn's Seedling,						5							5		
11. Maynard,										3					
12. Rosteizer,										7		4			
13. Hosenshenk,															
MEDIUM.															
1. Seckel,			4	3		1	5			4	6	1	8	2	
2. B. de Anjou,			5		2					2	7	2			
3. Flemish Beauty,				1		4	1			1	3	5	2	1	
4. Duchess,			2	4	3	2	4			3	2	8	6		
5. Sheldon,			3			5	2			7	8	7			
Scattering votes.															
6. Kieffer,				2					1	6	1				
7. Louis Bonne,						3	3				5		1		
8. Howell,					5										
9. Buffum,									2				4		
10. B. Clairgeau,												3		3	
11. Belle Lucrative,			1		4							6	7		
12. B. Bosc,										5		4	5		
13. Rutter,															
14. Prest. Clapp,				5	1					8					
15. Doy Boussock,															
16. White Doyenne,															
17. Le Conte,											4				
LATE.															
1. Lawrence,					2	2	2			1	2	2			
2. Vicar of Winkfield,							1			4	1	1	1	1	
3. Winter Nelis,				1	1	1				2	3	3			
4. Dana's Hovey,					5					8					
5. E. Beurre,					3					5	5				
Scattering votes.															
6. Glout Morceau,					4						4				
7. Prest. Drouard,															
8. Jones,															
9. Duchess 'de Bordeaux,															
Cherries.															
HEARTS AND BIGARREAUS.															
1. Black Tartarian,			1	4	1		4			4	3	1	2	2	
2. Governor Wood,				3			1			8	2	3	3		
3. Napoleon,										5	6	7	1	3	
4. Yellow Spanish,										1	7	4			
5. Black Eagle,				1	2						5	2			
Scattering votes.															
6. Ohio Beauty,				2						4					
7. Early Purple Guigne,										7				1	
8. Cumberland Triumph,										6			4		
9. Knight's Early Black,											1	5			
10. Downer's Late,															
11. Tradescant's Black Heart,					3		2								
12. Coe's Transparent,					4					2		6			
13. Big. de Mezel,													5		
14. Elton,															
15. Cocklin's Favorite,															
16. Conestoga,															
17. Rockport Bigarreau,							3				4				
DUKES AND MORELLOS.															
1. Early Richmond,	2		1	2	1		1		1	2	1	1	1		
2. May Duke,				1	2					3	4	3	2	1	
3. English Morello,	1		3	3						5	3	5	3		
4. Montmorency,			2		4		2			6	2	4			
5. Reine Hortense,					6							2	4		
Scattering votes.															
6. Late Duke,				4						1					
7. Olivet,					5		3			4					
8. Carnation,															
9. Belle 'd Magnifique,					3								5		
10. Belle 'd Choisy,															

PEACHES. *Varieties Arranged in the Order of Preference.*	Adams.	Allegheny.	Armstrong.	Beaver.	Bedford.	Berks.	Blair.	Bradford.	Bucks.	Butler.	Cambria.	Cameron.	Carbon.
EARLY.													
1. Mt. Rose,	4	5	5	*	1	1	...	...	1	...	...	...	...
2. Alexander,	5	1	1	*	5	2	...	1	...	...	...	...	...
3. Amsden,	3	4	...	...	3	5	...	4	2	...	...	...	1
4. Troth's,	1	...	...	...	...	6	...	...	...	...	...	...	...
5. Waterloo,	...	3	4	...	...	3	...	2	...	...	...	...	...
Scattering votes.													
6. E. Beatrice,	2	...	3	...	2	7	...	3	3	...	...	...	...
7. E. Rivers,	...	2	...	...	...	4	...	...	...	...	...	...	...
8. Wilder,	...	...	2	...	6	...	...	...	...	...	...	...	...
9. Surprise,	...	...	6	...	...	...	...	...	...	...	...	...	...
10. E. Lousie,	...	...	8	...	4	...	...	...	...	...	...	...	...
11. Briggs' May,	...	...	7	...	...	...	...	...	...	...	...	...	...
MEDIUM.													
1. Early Crawford,	5	1	2	*	3	2	1	1	4	...	...	...	*
2. O. Mixon,	2	3	1	*	7	4	...	3	1	...	...	...	...
3. Stump,	1	5	4	*	4	1	...	2	2	...	...	...	...
4. Foster,	3	2	3	2	5	5	...	6	5	...	...	...	*
5. E. York,	...	...	6	1	1	3	...	4	...	...	...	...	...
Scattering votes.													
6. Susquehanna,	...	...	7	...	...	7	...	5	...	...	...	...	...
7. Yel. Rareripe,	...	...	5	...	...	...	...	7	...	...	...	...	*
8. Reeves,	4	...	...	...	...	...	...	...	3	...	...	...	...
9. Red-Cheeked Melacoton,	...	4	...	...	6	...	...	...	...	...	...	...	...
10. Moore's Favorite,	...	...	...	...	...	6	...	...	...	...	...	...	...
11. Cooledge,	...	...	...	...	...	...	...	...	...	...	...	...	...
12. Geo. IV,	...	...	...	...	2	...	...	...	...	...	...	...	...
13. Wheatland,	...	...	...	...	...	...	...	...	...	...	...	...	...
LATE.													
1. Late Crawford,	2	1	1	1	1	1	...	1	1	...	...	...	*
2. Smock,	1	...	8	...	2	2	...	5	3	...	...	...	...
3. Salway,	3	4	4	...	...	4	...	3	...	...	...	...	...
4. Morris White,	...	...	...	...	3	6	...	4	...	...	...	...	...
5. Wager,	...	3	2	...	...	...	...	2	...	...	...	...	*
Scattering votes.													
6. Ward's Late,	*	5	...	...	4	5	...	...	2	...	...	...	...
7. Late Red Rareripe,	...	...	8	...	...	8	...	6	4	...	...	...	...
8. Heath Cling,	4	...	6	...	...	...	...	...	...	...	...	...	...
9. Heath Free,	*	...	5	...	...	7	...	...	...	...	...	...	...
10. Bilyeu's October,	...	2	...	...	...	...	...	...	5	...	...	...	...
11. Sener,	5	...	...	...	...	...	...	...	...	...	...	...	...
12. Steadly,	...	...	7	...	...	...	...	...	...	...	...	...	...
13. Bradley,	...	...	...	...	...	...	...	...	...	...	...	...	...
14. Hill's Chili,	...	...	...	...	...	...	...	...	...	...	...	...	...
15. Druid Hill,	...	6	...	...	...	...	...	...	...	...	...	...	...
16. Globe,	...	...	...	...	...	8	...	...	...	...	...	...	...
Plums.													
1. Lombard,	4	2	7	3	...	...	...	1	3	...	...	...	*
2. Ger. Prune,	1	10	1	...	1	...	1	...	2	...	...	...	*
3. Green Gage,	5	...	4	5	8	...	...	6	...	...	...	...	*
4. Yellow Gage,	...	8	8	6	...	...	...	5	7	...	...	...	...
5. Imperial Gage,	2	1	...	4	6	6	...	...	8	...	...	...	...
6. Coe's Golden Drop.	8	...	...	...	4	3	...	2	5	...	...	...	...
7. Wild Goose,	...	...	6	1	5	...	...	...	6	...	...	...	...
8. Washington,	...	7	2	...	...	...	...	8	...	...	...	...	*
Scattering votes.													
9. Richland,	...	...	...	...	2	...	...	7	1	...	...	...	*
10. Jefferson,	...	...	...	...	...	...	...	...	...	...	...	...	*
11. Shrop Damson,	3	...	8	2	7	...	...	...	...	...	...	...	...
12. Peach,	6	...	9	...	...	...	...	...	...	...	...	...	...
13. Gen. Hand,	...	8	...	...	...	...	...	...	4	...	...	...	*
14. Duane's Purple,	...	5	...	...	...	5	...	...	...	...	...	...	...
15. Monroe Egg,	...	9	...	...	...	4	...	...	...	...	...	...	...
16 Weaver,	7	...	...	...	...	...	...	4	...	...	...	...	...
17. Pond's Seedling,	9	...	...	...	...	...	...	8	...	...	...	...	...
18. McLaughlin,	...	4	...	...	...	2	...	...	...	...	...	...	*
19. Lawrence's Favorite,	...	...	...	...	...	...	...	...	...	...	...	...	...
20. Prince Englebert,	...	...	...	...	...	1	...	...	...	...	...	...	...
21. Miner,		...	5	...	...	...	...	...	...	...	...	...	...
22. Bleeker's Gage,		6	...	...	3	...	...	...	...	...	...	...	...

PEACHES. *Varieties Arranged in the Order of Preference.*	Centre.	Chester.	Clarion.	Clearfield.	Clinton.	Columbia.	Crawford.	Cumberland.	Dauphin.	Delaware.	Elk.	Erie.	Fayette.
EARLY.													
1. Mt. Rose,	4	1			1			2	1	1			
2. Alexander,	1	3			4			1	3				
3. Amsdem,	2	4					1	4	2				
4. Troth's,	3	2							4	2	*		
5. Waterloo,					5								
Scattering votes.													
6. E. Beatrice,		7									3		
7. E. Rivers,		5						3			4		
8. Wilder,		6					2				*		
9. Surprise,					3								
10. E. Louise,					2						1		
11. Briggs' May,											2		
MEDIUM.													
1. Early Crawford,	1	4			1		4	3	3	3	1		2
2. O. Mixon,	3	1			2		1	5	1	2			1
3. Stump,		2			3			2	2				3
4. Foster,		5					2			5			
5. E. York.					4		3	4	4	4	2		4
Scattering votes.													
6. Susquehanna,	4							6	6	1	*		
7. Yel. Rareripe,	2						6	1			3		
8. Reeves,		*						7	5				
9. Red-Cheeked Malacoton,	5				5								5
10. Moore's Favorite,		3			7						*		
11. Cooledge,		6			6						4		
12. Geo. IV,					8		5						
13. Wheatland,													
LATE.													
1. Late Crawford,	1	1			1			1	1	1	1		1
2. Smock,		2			2		1	3	3	2	*		4
3. Salway,		5					3		2				
4. Morris White,					5			4	5				2
5. Wager,									7		*		
Scattering votes.													
6. Ward's Late,		3						6					
7. Late Red Rareripe,	2						2		4				
8. Heath Cling,		4						2					3
9. Heath Free,					3		4	5			*		
10. Bilyeu's October,											*		
11. Sener,									8				
12. Steadly,													
13. Bradley,									6				
14. Hill's Chili,					4								
15. Druid Hill,													
16. Globe,													
Plums.													
1. Lombard,	1	7			1		1	1	2	3	4		3
2. Ger. Prune,	3	3					3	7	1	8			1
3. Green Gage,							2	2		1	1		2
4. Yellow Gage,		2			4		6	10		2	2		
5. Imperial Gage.	4	8			3		4	3					
6. Coe's Golden Drop,	2						5	4		5	*		
7. Wild Goose,		5								7	*		6
8. Washington,	5								5	4			
Scattering votes.													
9. Richland,		1						5		6			
10. Jefferson.							7						
11. Shrop Damson,													
12. Peach.					2			8	6				5
13. Gen. Hand,		6											
14. Duane's Purple,											*		4
15. Monroe Egg,													
16. Weaver,													7
17. Pond's Seedling,								9	4				
18. McLaughlin,		9											
19. Lawrence's Favorite,											3		
20. Prince Englebert,		4							3				
21. Miner,								6					8
22. Bleeker's Gage,													

Peaches. *Varieties Arranged in the Order of Preference.*	Forest.	Franklin.	Fulton.	Greene.	Huntingdon.	Indiana.	Jefferson.	Juniata.	Lackawanna.	Lancaster.	Lawrence.	Lebanon.	Lehigh.	Luzerne.
Early.														
1. Mt. Rose,	...	1	2	...	2	...	4	1	...	2	...	1	2	...
2. Alexander,	...	2	1	...	3	...	7	3	1	3	1	4	1	...
3. Amsden,	...	3	3	...	4	...	1	...	2	6	3	3	6	...
4. Troth's,	...	4	...	...	1	...	6	2	...	1	...	2	8	1
5. Waterloo,	...	...	...	...	5	...	5	5	...	7	4	*	3	4
Scattering votes.														
6. E. Beatrice,	...	5	...	...	...	...	2	6	...	...	2	...	5	...
7. E. Rivers,	...	...	...	...	...	...	...	...	...	4	...	...	9	2
8. Wilder,	...	...	...	...	...	...	...	...	...	8	...	5	...	...
9. Surprise,	...	...	...	...	...	...	3	...	...	5	5	...	...	...
10. E. Louise,	...	...	...	...	...	...	8	4	...	...	...	...	4	3
11. Brigg's May,	...	...	...	...	...	...	...	...	...	9	...	4	7	...
Medium.														
1. Early Crawford,	...	...	1	...	2	...	4	6	1	6	1	3	3	2
2. O. Mixon,	...	3	2	...	4	...	2	2	...	1	...	2	4	1
3. Stump,	...	1	5	...	1	...	6	1	...	2	3	4	7	3
4. Foster,	...	4	3	...	3	...	5	5	...	7	...	*	2	4
5. E. York,	...	...	...	...	6	...	1	7	...	3	2	...	6	...
Scattering votes.														
6. Susquehanna,	...	2	6	...	...	...	8	3	...	...	...	*	...	...
7. Yel. Rareripe,	...	...	...	...	...	...	7	...	...	...	5	5	5	...
8. Reeves,	...	...	...	...	...	...	10	4	...	4	...	1	1	...
9. Red-Cheeked Melacoton,	...	...	...	...	...	...	3	...	...	5	...	...	...	...
10. Moore's Favorite,	...	5	...	...	...	...	...	...	...	...	...	...	...	...
11. Cooledge,	...	...	4	...	...	...	9	8	...	...	...	...	...	...
12. Geo. IV,	...	...	...	...	...	...	...	...	...	9	4	...	...	...
13. Wheatland,	...	...	...	...	5	...	...	...	...	8	...	...	...	...
Late.														
1. Late Crawford,	...	5	1	...	1	...	1	2	1	1	1	1	1	3
2. Smock,	...	2	3	...	2	...	7	5	...	2	2	2	4	...
3. Salway,	...	1	...	...	5	...	...	1	...	3	4	...	3	4
4. Morris White,	...	...	...	...	...	...	8	3	2	6	...	•	...	1
5. Wager,	...	...	4	...	...	...	6	...	...	9	...	•	2	2
Scattering votes.														
6. Ward's Late,	...	...	2	...	...	...	...	...	...	...	3	...	5	...
7. Late Red Rareripe,	...	...	...	...	...	...	3	...	...	...	...	•	...	...
8. Heath Cling,	...	3	...	...	...	...	...	4	...	5	5	...	...	...
9. Heath Frees,	...	...	...	...	...	...	4	...	...	...	7	...	...	...
10. Bilyeu's October,	...	...	...	...	...	...	...	6	...	...	6	...	...	...
11. Sener,	...	...	...	...	4	...	9	...	...	7	...	...	...	...
12. Steadly,	...	4	...	...	...	...	10	...	...	8	...	...	...	...
13. Bradley,	...	...	...	...	3	...	2	...	...	4	...	...	...	...
14. Hill's Chili,	...	...	...	...	...	...	5	...	...	...	...	...	6	...
15. Druid Hill,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16. Globe,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Plums.														
1. Lombard,	...	4	1	...	6	...	8	6	1	1	4	...	7	1
2. Ger. Prune,	...	5	2	...	4	...	2	1	...	5	7	1	3	5
3. Green Gage,	...	7	5	...	1	...	7	7	2	6	1	...	1	...
4. Yellow Gage,	...	...	...	...	2	...	...	9	...	3	6	...	2	3
5. Imperial Gage,	...	3	...	...	...	...	...	...	...	2	5	...	8	2
6. Coe's Golden Drop,	...	1	...	...	5	...	1	...	...	10	...	4	5	4
7. Wild Goose,	...	10	...	...	10	...	...	5	...	9	9	...	9	...
8. Washington,	...	8	...	...	3	...	5	8	...	...	10	...	...	...
Scattering votes.														
9. Richland,	...	...	...	...	...	...	...	2	...	4	...	3	...	7
10. Jefferson,	...	9	4	...	7	...	3	...	...	8	...	...	4	...
11. Shrop Damson,	...	2	...	...	...	...	10	...	...	...	3	5	...	...
12. Peach,	...	...	6	...	...	...	...	...	...	...	...	...	...	...
13. Gen. Hand,	...	6	3	...	...	...	...	3	...	...	...	...	10	...
14. Duane's Purple,	...	...	...	...	...	...	...	...	...	...	2	...	...	...
15. Monroe Egg,	...	...	...	...	8	...	...	4	...	...	...	...	6	...
16. Weaver,	...	...	...	...	...	...	6	...	...	...	8	...	...	...
17. Pond's Seedling,	...	...	...	...	...	...	...	...	3	...	...	2	...	6
18. McLaughlin,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19. Lawrence's Favorite,	...	...	...	...	9	...	9	...	...	...	...	...	...	...
20. Prince Englebert,	...	...	...	...	...	...	...	...	...	7	...	...	...	...
21. Miner,	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22. Bleeker's Gage,	...	...	...	...	...	...	4	...	...	...	...	...	...	...

PEACHES. *Varieties Arranged in the Order of Preference.*	Lycoming.	McKean.	Mercer.	Mifflin.	Monroe.	Montgomery.	Montour.	Northampton.	Northumberland.	Perry.	Philadelphia.	Pike.	Potter.	Schuylkill.
EARLY.														
1. Mt. Rose,			5			1		1		1	2			
2. Alexander,			1			5					1			
3. Amsden,			2									5		
4. Troth's,						2	1			2	3	1		
5. Waterloo,			8					3		5	4	4		
Scattering votes.														
6. E. Beatrice,			4			4				4				
7. E. Rivers,						6				8	5			
8. Wilder,						8						2		
9. Surprise,							2					8		
10. E. Lousie,								2						
11. Briggs' May,							3							
MEDIUM.														
1. Early Crawford,			1			7	2			2	3	3		
2. O. Mixon,			2			2		1		4	4	5		
3. Stump,						8		2		3	2	1		
4. Foster,								4		5	5	4		
5. E. York,						8	1			7				
Scattering votes.														
6. Susquehanna,			5			4				1	1			
7. Yel. Rareripe,			8					8		8		2		
8. Reeves,						1								
9. Red-Cheeked Melacoton,			4			5								
10. Moore's Favorite,						6	8			6				
11. Cooledge,														
12. Geo. IV,								5						
13. Wheatland,														
LATE.														
1. Late Crawford,			2			1	1	8		4	8	1		
2. Smock,			8			2		1		1	1	2		
3. Salway,			4			4		4		3	2	8		
4. Morris White,						6	2			*	4			
5. Wager,			1					2		6	5			
Scattering votes.														
6. Ward's Late,						3	3			5				
7. Late Red Rareripe,								5		*				
8. Heath Cling,			5											
9. Heath Free,														
10. Bilyeu's October,						5		6						
11. Sener,										2				
12. Steadly,														
13. Bradley,														
14. Hill's Chili,														
15. Druid Hill,						7								
16. Globe,														
Plums.														
1. Lombard,			1		3			5		7	4			
2. Ger. Prune,										3	8	6		
3. Green Gage,			4			2	5	4		1	1	2		
4. Yellow Gage,			3		1		2	1		4		1		
5. Imperial Gage,					4		1					5		
6. Coe's Golden Drop,											2	4		
7. Wild Goose,					2					5	3	3		
8. Washington,								2			5			
Scattering votes.														
9. Richland,						1				*				
10. Jefferson,								3						
11. Shrop Damson,										8		7		
12. Peach,							3			6		8		
13. Gen. Hand,											6			
14. Duane's Purple,			2								7			
15. Monroe Egg,							6							
16. Weaver,			5											
17. Pond's Seedling,														
18. McLaughlin,								6						
19. Lawrence's Favorite,							4			*				
20. Prince Englebert,										2				
21. Miner,														
22. Bleeker's Gage,														

PEACHES. *Varieties Arranged in the Order of Preference.*	Snyder.	Somerset.	Sullivan.	Susquehanna.	Tioga.	Union.	Venango.	Warren.	Washington.	Wayne.	Westmoreland.	Wyoming.	York.
EARLY.													
1. Mt. Rose,	3	3								5	1		
2. Alexander,	4										2		
3. Amsden,	1									2	3		
4. Troth's,													
5. Waterloo,	2									3			
Scattering votes.													
6. E. Beatrice,	5									4			
7. E. Rivers,										1			
8. Wilder,													
9. Surprise,		2											
10. E. Louise,													
11. Briggs' May,		1											
MEDIUM.													
1. Early Crawford,	1	3			1				3	1	1	1	
2. O. Mixon,										2	2		
3. Stump,	3									4	6		
4. Foster,	2	2							1		4		
5. E. York,	4	1			2				2		3		
Scattering votes.													
6. Susquehanna,												*	
7. Yel. Rareripe,	5										5		
8. Reeves,													
9. Red-Cheeked Melacoton,													
10. Moore's Favorite,													
11. Cooledge,										5	7		
12. Geo. IV,										3			
13. Wheatland,													
LATE.													
1. Late Crawford,	1	1							2		1	1	
2. Smock,	3												
3. Salway,	4								1		2		
4. Morris White,													
5. Wager,													
Scattering votes.													
6. Ward's Late,	2												
7. Late Red Rareripe,												2	
8. Heath Cling,													
9. Heath Free,		2											
10. Bilyeu's October,													
11. Sener,													
12. Steadly,	5												
13. Bradley,													
14. Hill's Chili,													
15. Druid Hill,													
16. Globe,													
Plums.													
1. Lombard,	2		5	2	1			2	2	1	8		
2. Ger. Prune,	7	1	*						3	7	1	1	
3. Green Gage,	3	3		8	4			3		8			
4. Yellow Gage,		2	*		2			4	10		2	4	
5. Imperial Gage,	1	5	*	3	7			5			8	2	
6. Coe's Golden Drop,				5	3			6	4	3	7		
7. Wild Goose,	6		2		8				9				
8. Washington,			6	1	5			8		5	5	3	
Scattering votes.													
9. Richland,										4			
10. Jefferson,			4	6				1	7	6			
11. Shrop Damson,	4		3						5		6		
12. Peach,		4		7									
13. Gen. Hand,				4						2	4		
14. Duane's Purple,					9			10					
15. Monroe Egg,			*		10							5	
16. Weaver,	5				6				1				
17. Pond's Seedling,									6				
18. McLaughlin,			1										
19. Lawrence's Favorite								7					
20. Prince Englebert,													
21. Miner,									8				
22. Bleeker's Gage,								9					

OFFICIAL DOCUMENT, No. 2.

REPORT

OF THE

Pennsylvania State Dairymen's Association,

1888.

LIST OF OFFICERS.

President,
J. C. SIBLEY, Franklin, Pa.

Executive Committee,
J. B. PHELPS, 1st Vice President, Conneautville, Pa.
W. B. DENNY, 2d Vice President, Franklin, Pa.
A. M. FULLER, 3d Vice President, Meadville, Pa.

Secretary,
GEO. H. ST. JOHN, Meadville, Pa.

Treasurer,
W. W. DEAN, Meadville, Pa.

Vice Presidents,

I. P. Thomas,	Delaware county.
Milton Darlington,	Chester county.
Eastburn Reeder,	Bucks county.
Hon. Leonard Rhone,	Centre county.
Asa R. Sturtevant,	Crawford county.
Joseph B. Powell,	Crawford county.
John Cole,	Crawford county.
G. W. Carroll,	Erie county.
W. G. Moore,	Bucks county.
Alfred Paschall,	Bucks county.
Earl Love, Jr.,	Susquehanna county.
Joseph Kennerdell,	Lawrence county.
George Blight,	Philadelphia.
Joseph E. Gillingham,	Montgomery county
S. S. Spencer,	Warren county.
O. B. Fell,	Mercer county.

FOURTEENTH ANNUAL MEETING

OF THE

Pennsylvania State Dairymen's Association,

Held at Meadville, Pa., February 1 and 2, 1888.

The fourteenth annual meeting of the Pennsylvania State Dairymen's Association began in Library Hall on February 1, at 11 A. M., President J. B. Phelps, of Conneautville, in the chair.

Mr. A. M. **Fuller**, of Meadville, made a brief address of welcome in which reference was made to the excellent condition of the Association, and closed by welcoming all interested in dairying to the city of Meadville.

President **Phelps** then delivered the following address:

Gentlemen of the Pennsylvania State Dairymen's Association: In compliance with the request of your Executive Committee, I will try and give you a very brief opening address for this occasion. I presume there is but very few here but what knows the objects of this association. For fear that some may have an erroneous idea, I will state its object is for the advancement of the dairyman in his business in disseminating knowledge through the interchange of thought, and our experiences of one another, and of finding men from abroad that have made this business their study for many years, experimenting and testing to obtain the best results.

They give us their experience, and can it be possible that the farmers who are interested in the dairy business (and all are more or less) cannot but be benefited by attending these conventions. It is estimated by good authority that in this country there are two dollars expended for milk, cream, butter and cheese, to one dollar for beef, and yet the product is practically inexhaustible, and will always be in demand. The question may be asked if this be true why there are not more that follows this dairy husbandry, if it is so renumerative. I answer, many have tried it and have failed for lack of knowledge.

The novice who commences in dairy husbandry with the expectation of reaping rich reward, will, at the expiration of one year, find himself *badly left*, for reason—lack of knowledge. It is a business that requires diligent study and careful research to get a good profit for the labor. I believe that there are but very few to-day, in comparison to the many that are engaged in the business, that are making much profit for lack of knowledge.

One need not have to go far in the country, at this time of year, before he will see great need of missionary work. Cows will be standing out all day in the cold winds and storm, with no protection or shelter but a rail fence, and at night driven into a barn that all it is fit for is a wind break with manure piled up to the windows outside that seems as though it was placed there for the especial purpose of being thoroughly washed by the falling water from the eaves of the building, before being placed upon the land as a fertilizer. Also the patrons of butter and cheese factories seems to care but little how business runs so they get plenty of skim milk and whey in their cans when they return, trying to "save at the spigot and losing at the bung." And should you converse with them on dairy matters, they will invariably tell you dairying don't pay. Now as these are facts, and do exist in this country, had we not ought to have dairy conventions even more than we have had to *hound* the farmer until he changes his manner of doing business? I am much gratified, however, to say that all the farmers are not of this class; some are generally here and are always ready to find out the whys and wherefores of their business, and such, I believe, are making a good profit on their investment. But the former class needs the most instruction. How can we get them out here to inspire them to action? This question, I confess, has puzzled me much, and I will leave it to my successor, who I hope will have a more philosophical mind than your humble servant.

In looking over our dairy interests in the State, especially the western part, I find there are some points in our business that need to be thoroughly discussed.

1st. The selecting and keeping of better dairy cows. 2d. The cheapness and the quality of feed most desired. 3d. Suitable barns and stables to house our stock and the saving of fertilizers. These points I consider the leading ones, and should be greatly reformed. We have tried to procure speakers to discuss these subjects, and I hope they will give us light that we may be benefited thereby. I congratulate the dairymen in this vicinity in particular, in obtaining such good prices for their product the past season. Our cheese has sold for prices second to none in the United States, which I think speaks well for our association, and if we can get a larger yield with less cost is the objective point to reach for. I can see no just reason why our business will not be as remunerative in the future as in the past, and even more so when we become more enlightened.

G. H. ST. JOHN followed President Phelps in a brief address on

THE COW, AS SHE WAS, AS SHE IS, AND AS SHE SHOULD BE.

The history of the human race may be said to include the history of the cow. When our first parents were driven from the fields of Paradise they very soon discovered that the animals around them could be made to contribute to their comfort. Perhaps the first to be domesticated was the genus Bos; and I have sometimes wondered if one of the reasons why Adam's first-born was so prone to raise Cain with his human companions could not be traced to the fact that his boyhood training included the milking of a kicking cow.

When we take into consideration the great usefulness of cattle to man; how from the earliest ages of antiquity they have furnished him food and borne his burdens, we cease to wonder that the natives of the great oriental nations worshipped them; or that the traditions of the Celtic race place the cow among their Deities. And it is not unlikely that they were well reared by those who used them with special reference to the use to which they were put; but it is doubtful whether the cow that nipped the rich grasses upon the fertile plains of Asia rivalled the choice breeds of to-day in those characteristics which make them valuable to us.

As they found their way westward into Europe we find them spreading in large herds over the highlands of Spain, where the tastes of the people for bull-fighting induced breeders to breed for strength and ferocity, rendering dairying unpleasant and unprofitable. But those that found their way northward into higher lattitudes and colder climates required different treatment; and these conditions made changes in form and character in conformity with their use and surroundings. Shelter and food had to be provided in winter, and this had a tendency to make them more gentle and bring the cow more nearly into the family—the same roof often protecting both, with but a partition wall between.

From these herds of northern Europe came the progenitors of the cattle that dot our valleys and range our hillsides to feed the bodies, fill the coffers and comfort the souls of our people. We are unable to trace the history of the cow's development with certainty, but this we do know, that her influence upon the world's civilization can hardly be estimated.

She has ever been the healthy, copious efficient, wet-nurse of infancy, giving to the generations the power which fashion had shorn from our mothers, the ever-flowing fountain where the invalid finds restoration and the weak find strength.

Blot her from the earth and the breezes which waft the music of contentment would tremble with the wail of a suffering humanity. There seems to be two principal reasons or objects sought after by breeders, beef and milk. The former is thought to be most readily obtained through the Herefords and Shorthorns, the latter through the Ayrshires, Fresians and Holsteins for cheese and the Jerseys and Guernseys for butter.

There is no doubt that the raising of cattle for one or both of these purposes is the best means that farmers of western Pennsylvania can take to preserve the fertility of their farms and at the same time reap a fair profit. And it seems to us that the breeders who unselfishly enlighten the ignorant, or assist the needy husbandman in his efforts to accomplish this in the best manner, is serving a better patriotism than he could possibly do even at the tail of a committee in the State or National Legislature. It seems almost impossible to make any marked improvement upon the best specimens of our leading breeds of cattle. Indeed any changes for the better must be made slowly, and acquired with much effort. But there is a field of improvement which is large and fertile. The high price and comparative scarcity of thorough-breds have prevented the great mass of milk raisers from attempting to make any rapid change in their herds of common stock; consequently we have many small dairy farms stocked with some good, but too many inferior, cows; and these latter too often absorb the profits from the better paying individuals of the flock

We believe there is a remedy for this. Let our factory man visit the herds of their patrons, and, by proper tests, point out the mistakes that are unconsciously being made. Let him show the kind of milk from which the most profit can be derived.

If you want to reach a man effectively, just touch his pocket book. Then every sense is on the alert, and he is ready to let down the bars of his prejudice and step out into new fields.

If factory men would take the proper pains to convince their patrons that their interests are mutual, and in coöperation alone is perfect success, the herds would be improved, the profits increased and their dealings with each other more cordial and satisfactory. The yearly meeting would lose much of its dread and uncertainty, and a cordial business spirit would take the place of the bantering, haggling one too often endured.

When a feeling of confidence is established the factory man can then safely propose an improvement in the cows of his district by procuring a thorough-bred bull for grading up. This might be done by each willing patron giving his order on the treasurer for payment for such a number of cows as he would furnish for service. Let the breeding animal be kept in a convenient place near the factory, perhaps, and you have a beginning of an improvement that, in due time, will grow to paying proportions.

"Whatever a man soweth that shall he also reap."

The greatest difficulty which seems to present itself by this plan would be the selection of a breed. But we believe enough patrons could be found to agree on that point, in every factory district, to furnish cows enough for one bull; and when you have set the ball rolling it would doubtless continue with little aid.

The time is close at hand, if not already here, when every cheese factory will be obliged to have a creamery attached for winter dairying. In such a case it makes but little difference whether the choice should be Channel Island, Dutch or Scotch. Men in general are so ignorant of the composition and qualities of milk that they follow a blind prejudice, regardless of pecuniary interest. The intelligent factory man will take pains to teach and enthuse his patrons, and when this is faithfully done the average cow will rapidly advance to a higher grade. Breeders, too, must aid the cause by giving the lowest possible rates.

We have said but little about the Shorthorn; indeed she is too general a favorite to need much praise. Men regard the cow as they do woman; the man is not yet born who does not admire a handsome woman, and the farmer does not live who is not captivated by a large, handsome cow. The fine proportions of the Shorthorn have fixed her destiny. The creamy complexion, and silky hair and gentle disposition of the Jersey has conquered many a man and compelled him to acknowledge her as queen of his butter; the Holstein has bound him with her raven and snowy bands, and charmed him with her ample proportions until he is compelled to hail her queen of his cheese; but when Mrs. Shorthorn passes before him with her placid countenance, and majestic step, and royal proportions, he bows at her shrine and crowns her queen of the field.

In the coming time, the scrub will be driven back to the mountains and the desert, like the Aborigines who once cumbered our soil. The survival of the fittest will then, in her case, be a mooted question no longer.

When men become truly conscious of the fact that, from her full udder she is pouring into the arteries of our people a goodly portion of the strength and energy and life which is making our name great and our national career glorious, when they realize that she, in her purity, is filling with virtuous product the ghastly void which alcohol is making in our body politic, pouring out a beverage to delight instead of damn, then will philanthropists accord her honor, statesmen will protect her rights, and saints will canonize her name.

Then indeed will her millenium have come wherein no milkingstool fragments shall fly in meteoric showers from her back, no angry boy shall dare to stone her, no brutal man shall kick her, but the fulness of the land shall be her portion, and the homage of the nations her rightful heritage.

Following the address of Mr. St. John, came a brief discussion of the subject in general, the principal point being brought out by Mr. Edmonds, of Sherman, N. Y. He reported an instance where a dairyman of his section increased his dairy product 40 per cent. by going around among his neighboring dairymen and purchasing their best cows and then feeding them properly. This procedure was considered impracticable by the dairymen present. A better way was thought to be for each dairyman to improve his herd by proper selection and grading. This was considered practical and profitable.

AFTERNOON SESSION.

Meeting called to order at 2.20 P. M., President Phelps in the chair.

The chair granted further time for reports of officers, and introduced Professor H. B. Armsby, director of Pennsylvania Agricultural Experiment Station, subject,

The Relation of Feeding to the Quality of Milk.

Ladies and Gentlemen: I had not expected, until I arrived in this place, to speak on this subject, and I trust you will pardon any lack of preparation which may make itself apparent. It gives me great pleasure to meet the State Dairymen's Association on this occasion. It is part of my business just now to get acquainted with the farmers of this State, and it has been my experience elsewhere that the dairymen, more perhaps than any other class of farmers, represent the most intelligent and most progressive portion of the farming community, therefore, I may consider myself especially fortunate in meeting this association at the outset of my work in this State.

The subject, the influence of feeding on milk, is a very broad one. I shall not attempt to speak of all aspects of the question, but only of the one suggested, the influence on the quality of the milk.

In order to get a proper understanding of the influence of feeding on the quality of milk it is necessary to begin at the formation of the milk itself and consider how the cow makes milk. If we take the udder of the cow in the full flow of milk and dissect it, we find its structure representing somewhat a full bunch of grapes. We find leading up from the teat, a little above the basis of the teat, an opening, not very large, known as the milk system; leading off from that a number of small ducts or tubes, in different directions; following these up, we find they divide and sub-divide until at last they end in little globules. To make the comparison, we might compare the main channel through which the milk is drawn, to the main stem of the bunch of grapes, and following out into the branches, these branches divide again and again, until at the end of the branch we get three or four or fives grapes in a cluster, we find a cluster of these little globules, to be discovered by a microscope; there are three or four of these or more, and they unite together and have an outlet through these ducts.

These little sacks, lobes or lobulae we find to be lined with something quite resembling the mucus membrane of the mouth or in the cavities, a thin skin, but different. The skin inside of the mouth is different from the outside of the body; the lining of these globules is somewhat similar to the lining of the mouth, yet somewhat different. It consists of a layer of cells with a filling of a somewhat jelly-like consistency, surrounded by a membrane more resistant than the contents of the cell itself. It is inside of these cells that the milk is produced, and the way they produce it is somewhat curious.

When the milk flow is set up, after the birth of the calf, these cells, which had a sort of jelly-like consistency, begin to fill with minute drops of fat, which are produced in some way by the vital action of the cells themselves. These cells are abundantly supplied with nutritive material from the blood, which passes through the walls from the blood vessels. They do not get these drops of fat from the blood directly. These cells get the materials, and may be considered independent beings. They have a life of their own; they live and grow, and at this time begin to produce globules, and continue until the larger part of the contents of the cell is replaced by these minute drops of fat; then the whole cell passes off by the ducts, and a new cell is begun; the old cell having sloughed off, becoming dissolved goes to form milk.

It has been held that the cell itself dissolves, and also that the contents of the cell pass off and the cell goes on and makes more milk.

Which ever view we take, it is these little cells that produce the milk, and it is upon their action that the quality of the milk depends. It is in the first place upon the number of them, and upon their activity that the quantity of milk depends. We may have a cow with a large udder, and with comparatively small or feeble development in the cells. Considerable may be taken up with connective material which holds together these little globules, and leaving little space for secreting tissue ; this tissue may be there, and it may produce milk slowly, not a great deal in the course of twenty-four hours. The quality of the milk depends in the first place upon the way in which these cells act. And before going further it will be well to understand exactly what is meant by the quality of milk, because otherwise some confusion may arise. By the quality of milk I do notmean the high flavor, or the color, or any of those comparatively unchanging qualities, which of undoubted importance, are yet sometimes at least, of subordinate importance. What I mean by the quality of milk is the proportion of different nutriments it contains, which make up from eighty-five to eighty-nine per cent. of the weight of the milk, that is, from eighty five to eighty-nine pounds out of every hundred of milk, with the water it holds in solution or suspension, to the other proportions of milk.

Next to water, usually in abundance, comes the butter fat of the milk, which exists in the milk not dissolved, but in the form of extremely minute fat globules, little drops which give the milk a white color. The little drops themselves are like drops of water, and give the milk a white color, in the same way that snow appears, although it is crystals, the reflection produces the white appearance. So with the milk. We get a thick white fluid. The fat of the milk is perhaps the most variable. It is sometimes as low as two and one-half per cent., possibly lower, and rising as high as seven, even a little more than seven per cent. Cases are reported in which it would seem from the butter yield the percentage must have been higher, but I have not seen any that gave over seven per cent. and that is exceptionally high.

In addition to this we have the casein, partly dissolved in the water and partly in spongy forms. This varies much less than the fat, two and one-half and three per cent. Then we have the milk sugar amounting to about four per cent.

I do not know whether my figures will add up or not. Then we have a little ash which amounts to from eleven, twelve to fifteen per cent., total solid matter in the milk.

By quality of milk I mean the proportion of these different ingredients.

If the amount of fat was increased the amount of casein would be also increased. I think you will readily see from what I have said that the quality of milk must depend in some instances in the way in which these little cells perform their functions. If the growth is such that they form a large excess of fat, then the milk will be fat. On the other hand if there is only a moderate amount of casein then the milk will be richer in casein and poorer in fat, and so on with the other ingredients.

Perhaps the most can be made out of the individual cow. We know perfectly well that one cow will give rich milk, and you cannot make a poor cow give good milk; it is an inborn peculiarity in the cow. Some cows will give better milk than others. That means these have the secreting surface in the udder so constituted that in one case they produce a good deal of fat and in the other case they produce very little. You can no more succeed in making a poor cow give good milk than you can in making a hog produce a streak of lean and a streak of fat for butchering by starving it one day and feeding it the next.

Another potent feature is breed, indeed this is but an extension of the feature of individuality. This means simply that certain cows have been bred in a certain way, and have the power of transmitting their inherited peculiarities to their descendants.

If we have a scrub cow which gives very rich milk we are very uncertain whether her calf will also give very rich milk. It is largely a matter of chance whether her descendants will have the same quality. On the other hand a pure-bred cow which has this peculiarity is very likely to transmit to her offspring the peculiarity. The difference between the individual and the influence of feed upon the breed is simply in one case what we would call a sport of nature, a peculiarity simply in one cow, while in the other case it is an inherited peculiarity.

This is one among the features governing the quality of the cow's milk.

On the other hand, feed is not entirely without influence upon the milk of animals. Its influence in the first place, is upon the amount rather than the quality of the milk. In a large number of experiments it has been found that richer feeding has resulted in making the milk less watery, in other words, increasing the total number of solids, fat, casein, sugar and everything.

By richer feeding I mean, in the first place, more generous feeding, a larger amount of food per day per cow; in the second place, not merely a larger amount, but food of better quality; a larger proportion of grain food for example, that is digestible, like oil meal, sprouts or brewers' grain, which contain valuable producing qualities. Feeding of this sort has been almost universally found to increase the fat. Three per cent. of fat we might find upon increasing the feed perhaps three and one fourth per cent. At the same time we get this increase in fat we shall find that we have had a corresponding increase of everything else. Rich feeding would not make rich in fat alone, but also in casein, sugar, etc. In other words it makes the milk less watery. When the cow is well fed her udder puts less water in the milk. It has been said that rich feeding had no effect upon the quality of the milk, meaning it did not produce fat and nothing else. Rich feeding does make milk richer. You can get more butter out of a pound of milk out of a cow well fed, other things being equal, than one poorly fed. In other words, it will take less pounds of milk to make a pound of butter, and a correspondingly less amount of milk to make a pound of cheese. If you leave out of account the effect of feeding you do not make the milk richer under ordinary circumstances. If you increase the fat you increase the casein as well. There have been noted, however, a few cases contrary to this rule.

There have been cases of German experiments, where the cows were fed paramount meals, somewhat resembling oil meal. This was used in food a number of years. They found two cows in which this particular feeding is said to have produced a greater increase of fat than of the other ingredients. On the other hand, in the other cows no such effect was observed. Another food which has been observed to produce this effect is brewers' grains. It is possible also to feed meal, which is a favorite food in these factory tests.

I do not wish to be understood as making the statement positively that meal will produce more fat, but some experiments made under my eye seem to indicate that.

Leaving out of account these apparently exceptional cases, the rule is that neither the use of fodder or mixture of fodders can do anything more for the quality of the milk than to increase the solids in ordinary cases. You cannot produce more butter unless you produce more of everything else. Yo can readily see from what I stated in the beginning why this should be so. Milk is produced by the action of the cells and its quality depends on the quality of the cells. If you want rich milk you must get a machine to make it—the cow—one having the capacity, and if you supply plenty of good meal for the machine to work on, you will get a large quantity. If you feed well you will get a yield of a large quantity and good quality of milk.

A MEMBER. What is the effect of feeding corn on the cobs, if you have used it?

Prof. A. No, sir; I never tried it personally, but I have known of experiments in which it was tried; my recollection is that they showed no especial effect upon the quality of the milk.

Mr. SIBLEY. I think that Prof. Armsby has given us one of the most lucid explanations of how milk is produced that I ever had the pleasure of listening to. I had supposed from some tests made that there must be a very much larger percentage of solids in some cases than in others. There are, I believe, well authenticated cases, from the very highest official and personal character, committees appointed that had no connection with any association of men owning animals, in which three and one-half and four pounds of milk has been reported as making a pound of butter. In those cases I cannot conceive why the percentage of solids must not have been greater than the Professor has stated to be the maximum.

Prof. ARMSBY. There are some things about those tests which are a little difficult to explain. For one thing it must be remembered that the animals upon which those tests are made have been placed in a course of training for a considerable time before the tests are made, and furthermore that feeding of those animals is forced to the utmost limits of safety in order to make those records. There are exceptional cows under exceptional circumstances, therefore it is not so surprising. Moreover, I said, I think, that the highest percentage shown by chemical analysis had been about seven. In the cases of these phenominal tests neither the milk nor butter which was produced was subjected to analysis. There is considerable apparent variation between the results of the chemists and those of the buttermaker, because butter is by no means pure fat. If you have seven per cent. of fat it does not follow that in every hundred pounds of milk you ought to get seven pounds of butter. In the process of creaming you do not get all out of the milk; a little is left on the skim milk; in churning, a little more of the fat is left on the butter milk; so that out of seven pounds of fat supposed to be in the milk you will not find all of the seven pounds in the butter. Commercial butter contains in the neighborhood of twelve to fourteen per cent. of water. The percentage of water may run up to twenty per cent., which increases the weight. In case there were any desire or intention of fraud in connection with these tests, it would be easy to add something which would precipitate the casein with the butter. There are undoubtedly cases on record where the tests have been conducted by men of the highest character, beyond any suspicion of collusion with interested parties, and where the results have been very much higher than those I have mentioned. We can only conclude that the composition of the milk was exceptional, and the part of fat phenominally high, and until these have been tested by chemical analysis we know very little about them. Take the one mentioned where it took between three and four pounds of milk to produce a pound of butter. Four pounds of milk for a pound of butter means twenty-five per cent. of fat in the milk. There must have been some casein, sugar and other things; suppose those ingredients were very much above the normal; say the sugar and ash eight per cent.; that means about thirty-five per cent. of solid matter in the milk. Good solid beef steak has about twenty-five per cent. solid matter and about seventy-five per cent. water. So, this must have been considerably thicker than beef steak. I do not say it was not, but I wish somebody would send me a sample of that milk.

Mr. SIBLEY. The American Jersey Cattle Club instituted a rule by which all tests to be known as official required that a certain amount at each churning should be sent to the chemist. Not chemists interested in the cattle club, but to the experimental station at Geneva, N. Y.

Prof. ARMSBY. When was that rule adopted?

Mr. SIBLEY. I think the last two years. I was there two years ago this winter, when Prof. Babcock showed me all the tests sent in. The butter is tested there in every individual instance before it is sent out under the sanction of the club.

Prof. ARMSBY. I was not aware of the fact. I would like to ask the gentleman where the reports of the analyses are to be found.

Mr. SIBLEY. I can show you some in the reports issued by the experimental station.

Prof. ARMSBY. I was aware that some analyses had been made in

New York, and some reports made in the report of the experimental station, and also a number of the tests at the dairy show last fall in New York, but I was not aware that the butter had been analysed. May I ask you further if you know whether any of those very large yields have occurred since the rule was adopted?

Mr. **Sibley**. I think the tests were limited. I knew we had some official tests; they were sealed up and sent by express direct to Prof. Babcock during the tests. It will be three years ago in July since that occurred.

I think while we have statements made we ought to get some information. Our friend, Colonel Straw, asked the question if a cow was a very small butter cow, was not she perhaps a very rich cheese cow, so that what we lost in one way we gained in another.

Prof. **Armsby**. That will depend on how well you like skim-milk cheese. If a cow gives skim-milk, you can make skim milk cheese; the more nearly her milk approaches skim milk, the more nearly will the cheese approach that.

Mr. **Phelps**. I would like to ask whether it is not possible for a cow to be rich in casein and poor in butter, and *vice versa*?

Prof. **Armsby**. Yes. Undoubtedly, milk may be poor in butter fat and rich in casein, although it is not so likely to be, because casein varies a good deal more than butter fat. The point is when your milk is poor in fat, when you come to curd it in cheese, you get all your casein and fat, and unless you get a reasonable proportion of fat your cheese is poor. It does not come up to the standard; it approaches skim-milk cheese. On the other hand it is possible to have milk so rich in fat that it would not be profitable in cheese, poorer milk might be good for cheese.

A **Member**. Please state if milk might be too rich for calves.

Prof. **Armsby**. I cannot answer definitely, because I have not had experience on that point. It is claimed, I believe, that milk may be too rich, especially in fat, and effect injuriously the digestion of calves. I think it would be more in the fat.

Mr. **Cutshall**. We have some young calves that seem to be affected. I don't know that I have ever noticed it so much as I have this winter. We have a good many young calves this winter, and feed them pretty well; feed them pretty rich food; we feed them meal mixed some with oats. We have heretofore fed lighter food and more bran, but bran is dear this year, and we raised a pretty large crop of corn, and are feeding that way.

Prof. **Armsby**. What is the grade of your cows?

Mr. **Cutshall**. They are shorthorn. It may be the calves take too much, I do not know. They are with the cows nearly all the time; the cows are out some of the time; the calves are with them all the rest of the time. The calves are from two weeks to four months old; we have some four months with the cows. The older ones are past that. I would like to know if I could remedy it by changing the feed.

A **Member**. I would like to ask Prof. Armsby if some tests are not conducted on the oil-test plan, and I would like to ask his opinion of the oil test.

Mr. **Hoard**. I have had some experience. A calf will never suck a cow of mine, no matter how lazy I am. A very excellent remedy is the use of lime water. That you cannot use through the cow. There is danger in allowing the calf to suck its mother. I grew a high-grade Shorthorn calf, not owned by myself, but under my direction. A neighbor of mine called me to see a calf just dropped that weighed ninety pounds. I says to him, "What are you going to do with it?" "Keep it until it is two or three weeks old and sell him to the butcher." I said, "Don't do it; keep him on rations." He thought it was too much trouble. I coaxed him to put it on rations, which I had demonstrated to my satisfaction. He had a Cooley creamer; it would bring the skim milk sweet. I coaxed him to give the calf about twenty-four pounds a day, fed four times a day, until he was three weeks old, then three times a day warm, with the addition of a little soft oatmeal porridge. If the calf showed any indications of constipation, to use a little linseed oil. He grew the calf, and when it was four months old it weighed two hundred and forty pounds. It had no new milk after it was three days old. He increased the ration a little so far as the oatmeal was concerned, but my observation has been with the growing calves of Illinois and Wisconsin, while you make a calf increase its weight, at two years of age it will take whole milk. The University of Illinois, at the experimental farm, demonstrated that very clearly. Calves of two years of age fed with skim milk properly, beat calves in weight that are not. There are three simple rules that nature lays down which should be followed in the handling of a calf. When I say that, I say it perhaps as an indictment upon perhaps ninety-nine farmers in a hundred. We seem to steadily forget we have any sources of information and take on our own notions. A calf sucking the mother will suckle the mother from twelve to twenty times a day; hence, that is an injury done the mother. She gives the calf food often, and, as consequence, it is not liable to bring on ——— ——— precipitates the gastric juice into the stomach, then produces indigestion. It is sweet. Nearly five-thirteenths of all solids is milk sugar. If we fail to get the sugar, we have robbed our milk of one-half the solids. We can see the necessity of keeping the milk sweet. The mother gives it to the calf warm. Those simple rules grow out of feeding not less than three times a day, never feeding sour, and always feeding warm.

I drew, when I was a boy in New York, the only premium, three years in succession, at the Madison county fair, with the skim milk of three cows, using a dollars worth of oatmeal to each calf, and I have since grown, when I was making cheese, more than fifteen heifer calves, drawing whey, and with a dollars worth of oatmeal, and I have never seen a more healthy set of calves. In case they showed signs of constipation, I gave a little linseed meal.

I think we have not come yet to a clear understanding of how economically and how perfectly we can grow calves upon skim milk. In my own experience I find skim milk worth from thirty to thirty-five cents per hundred. I use a Danish separator. I can make skim milk worth from thirty to thirty-five cents a hundred.

A MEMBER. Suppose you wish to kill a calf, would you take it away from the mother immediately after it was dropped, and feed it milk from the cow?

MR. HOARD. I will make a six weeks veal instead of a four weeks. With the use of linseed meal, frequently fed warm, I can produce a very nice calf.

A MEMBER. You would not feed it just as it comes from the cow, but skim the milk?

MR. HOARD. Yes, sir; if I wanted him to grow faster; better feed and oftener.

A MEMBER. We have been in the habit of letting the calves suck the cows.

Mr. HOARD. I cannot afford to put twenty-five cents worth of butter into five cents worth of veal.

Mr. CUTSHALL. Can I do anything to my calves to prevent scouring, providing they are sucking the cow?

Mr. HOARD. Not unless you can learn the calf to drink. If you can get the calf to drink, and put a piece of lime as big as an ordinary hen's egg into a Mason quart fruit jar, turn water on it and let it effervesce, two tablespoonfuls will in many instances stop it, particularly if the scouring comes from acidity, which it does in seventy-five per cent. of cases. If it comes from richness nothing will cure it except giving the calf poorer milk. Jersey cows often produce that state of affairs.

Mr. CUTSHALL. My cows are not Jersey cows. They are Shorthorn. We will have to do something for the calves while sucking the cows if we do anything at all. I am just with my calves like I am with my boys. I would be one step nearer the throne to-day if I had not learned my calves to drink. The gentleman says we should not try to correct nature, I think the gentleman was trying to get ahead of nature or he had a creamer to sell. Wouldn't it be well for a man to skim the milk for his colts and get bigger and stronger horses. We might rig up some kind of a machine. We might have better lambs for the fourth of July market if we could skim the milk of the ewes. Our calves scour and I am sorry for it. If I had enough calves I would double them up. I have raised some steers that are worth having, and I will give any man a hundred dollars who can raise the like on skim milk. I raised some calves on skim milk and oatmeal, and at two years and nine months of age they were sold in New York for five hundred dollars. Two years ago last February they brought the price of beef.

Professor ARMSBY. In regard to the use of the oil test. The tests made by the American Jersey Cattle Club are not made by the oil test. They consist in creaming, churning and weighing the butter. I am not aware of any tests of that nature. Oil tests have been used at certain fairs where the cows have been tested in public. At the Minnesota State Fair last fall, and possibly at some other fairs, but not in any of these so-called official tests. The oil test may be used either for milk or for cream. For cream I consider it a valuable test, and probably as accurate or more accurate than any quick method we have. It is not absolutely accurate. If you take a dozen samples of cream—the same cream—and churn them together they will not all give the same results exactly. For milk it does not seem to be satisfactory. Of the amount you can put into one of those little test tubes there is not enough to permit accurate measurement. That seems to be the great difficulty. J. A. Smith was appointed by the State Dairymen's Association to investigate with a view to its use in the cheese factory. He has devised a churn which obviates that difficulty. I have considerable confidence that the oil-test churn may be improved so as to give satisfactory results for both milk and cream. For practical purposes I believe it to be of considerable value.

A MEMBER. The matter of feeding sweet whey to calves was mentioned. A gentleman told me that he had made a practice of scalding whey, and running it sweet. By passing a steam pipe into the boiler it had the effect of coagulating the albumen and preventing the sugar from becoming acidy.

Prof. ARMSBY. The practice has been introduced in a number of places in this country and Europe with good results. The explanation is that the souring is produced by certain germs, the whey collects the germs, it takes some time before they get into it. Scalding keeps the milk sweet.

A MEMBER. Do you think it produces a bad effect upon the animal?

Prof. ARMSBY. I do not.

A MEMBER. I would like to ask what benefit there is in having milk tested by the oil test or the other, which gives the best satisfaction?

Prof. ARMSBY. The oil test churn is much the preferable, for the reason that the volume of cream is richer than milk. Where the oil test is used the cream is actually churned, you virtually get the butter instead of making cream. You weigh it and get a certain bulk of butter, and you know how much that butter fat would weigh, you virtually make that test by weight.

A MEMBER. Where milk is hauled five miles would you get the same per cent. as if it was hauled only one mile.

Prof. ARMSBY. It is quite possible not. Transportation for a long distance causes the cream to rise more slowly than a short distance.

Mr. PHELPS. Speaking of volume and weight, calls my attention to the fact that we had a little experience at our factory last summer. We prepared to heat whey, and thought we would kill every germ. We were asked what is the matter with that whey; it is boiling hot. We were not met with that degree of satisfaction that we expected to be. Everybody said they had got their whey hot; it scalded the calves. The calves' noses got bit.

Mr. HOARD. I must say that I think the president did not read the directions right. It is essential to cool the whey to at least fifty degrees after scalding. That is the difficulty with your whey. We have experimented and it is a complete success. We have in our creamery what is known as a beer cooler; it is the same as used in a brewery for cooling beer. There are pipes, the milk is warmed up to eighty and eighty-five degrees, and it must be cooled immediately. As the cream comes from the separator it drops on the pipes, and through these pipes is run cold water. The water is as low as forty-eight, being driven through suddenly. The cream separates into thin film, and cools down to the temperature of the pipes. The same thing we have for the whey. We introduce the steam jet into the vat, heat it to one hundred and forty, run it out over the cooler into another vat, and you have the thing all right.

Mr. PHELPS. We could not find a process by which we could cool it without ice. My impression is that it can be done with a little trouble, and instead of people cursing the whey they will call it a God-send.

Mr. EDMUNDS. I shall follow Mr. Hoard's system of feeding calves. Furthermore, I think that every creamery man in Pennsylvania ought to know of his system of cooling cream as it comes from the separator.

ADDRESS.

By T. S. STROHECKER, *Cooperstown, Pa.*

Mr. President and Gentlemen of the Pennsylvania State Dairymen's Association: The indispensable requisites "to make dairying pay on small farms" are good cows, plenty of good feed, pure water and a sensible wife.

When I received the invitation to address you, I felt that this association had made a mistake, and that I had mistaken my calling. I handed the secretary's letter to my wife with the remark, "the idea, that I should attempt to say anything that would interest veteran dairymen." She interrupted me by saying, "the Association has not made a mistake, and you have not mistaken your calling. See the subject they have assigned you, 'How to make Dairying Pay on a Small Farm.' They want a small farmer to tell that, and where could they have found a smaller one to do it?" When I say *good* cows are indispensible to make dairying a success, naturally, you will ask, what breed of cows do I recommend? I do not recommend any particular breed. Good cows are found among all breeds, even among our native White Oaks, and so are also poor ones. Dairying may properly be divided into three classes — buttermaking, cheesemaking and selling to families.

The same breed of cows will not answer for all these purposes, and yet we often find individual cases in the same breed to acceptably fill all three classes. The first thing for the farmer to do is to start out with a well-defined purpose, keeping that purpose constantly in view. In some localities, and some seasons, selling the whole milk apparently pays better than anything else. I say "apparently" because the facts are rather delusive. With good butter cows, good water and cans, the cream may be sold to the creameries and yield quite as large an income as if the whole milk was sold, and have the skim-milk besides; and if the butter is churned at home, you will have the skim-milk and butter-milk for the calves and pigs. This is quite an important factor to be taken into consideration in making dairying pay on a small farm. During the summer months, however, a sensible wife will insist that it is time to wean the calves that were, as all should have been, dropped during the preceding months of October and November, that the pigs will do very well on the skim-milk and clover. She will insist upon selling the cream and I am quite certain that, taking her health and welfare into consideration it is more profitable to sell the cream than it is to churn it on the farm, even with all the modern conveniences at hand. As it is usually conducted on the farm it is about the next thing to an intolerable nuisance. The man who allows his wife to go buttering with a lot of shallow crocks or pans in which to raise the cream, is sadly in need of reform. Because his mother and grandmother used to scour a couple dozen crock lids, scald a couple dozen crocks, and skim over such a large surface for the cream, is not said that his wife should also do it, when more convenient and better methods are at hand costing but a trifle. When I say "to make dairying pay upon the small farm" I want to be distinctly understood that I take other matters into consideration beside mere dollars and cents. I do not believe that the highest realization of profit consists in dollars and cents, gained at the expense of broken down health, and nowhere else as on the farm do we find a more fertile field for destroying the health of the women than in the dairy. Therefore, I insist that even if other departments must suffer the dairy at least shall be as convenient as possible, and so shall everything else pertaining to it. The first thing in the arrangement then, is a good milk room. I know of nothing better for this than the stone spring-house. I want a tank to hold water from a running spring. I care not of what material the tank is made, only so there is a depth of ten to twelve inches of water in it. I want it so arranged that the water can all be drawn off at any time to clean it. If no running spring water is at hand, or can be brought to run into the tank, then recourse must be had to the pump to fill it, and if ice can be had to put in all the better. I want tin cans that hold five gallons; into these strain the milk. I use a strainer specially made, wide enough to rest on top of the cans; it has a fine wire strainer, and underneath a cloth is held on the rim by passing a ring over it. This makes it a double strainer—first through wire, then cotton cloth; then set the can with milk into the tank of cold water. Some cans it is necessary to keep the lid on until after the milk has cooled. The kind I use we put the cover on immediately. It covers over the can and dips down into the water. A small cap on top of the cover is left off until the milk has cooled, when it is screwed on, effectually shutting off the surrounding atmosphere. On the side of the can is a glass gauge to measure the depth of the cream. A gauge, or inch in depth, is supposed to make a pound of butter. It is not, however, an invariable rule nor true guide to go by. The kind of food that is fed to the cows has much to do in determining the quantity of butter in what is known as a space of cream. And so has also the kind of cows, rich cream often making more than thirty per cent. of butter to the space, and poor cream that much less. Cream that is raised with ice or very cold water is thinner, puffed up to measure more gauges of cream and less pounds of butter to the gauge. Those who use ice in raising their cream are the ones who, by selling to the creameries, make "dairying on the small farm pay."

Admitting that it is the correct way of raising cream, it is however a very questionable way of selling it, for it must be done at the expense of others, or creameries would not make it pay. But having plenty of help, and determined to "work it for all it is worth" on the small farm, we will just skim it ourselves and churn the cream when it is slightly acid, and at a temperature of about sixty degrees. We will use what is called the "revolving churn," because it has none of those ingenious tricks about it to deceive the unwary into the belief that it is necessary to have a vast array of ingenious dashes, paddles, wheels and "fixins" about it to make the butter come quickly. It is simply a barrel tumbling end over end as the crank is turned, raising the cream up in one end to fall down against the other, churning on the principle of concussion, every drop of cream alike; like the rolling waves of the sea beating against a rock, or like the ancient Arab custom, putting the cream into a skin sack and with a rope and horse attached, dragging it on the ground as he rides along. This is progress "aint it." Well not much, 'tis true, for even the Arab used horse power in churning, whilst the small farmer, or his wife rather, turns the crank by hand. Show me, if you can, among all the patent devices in the land a single one that improves one iota upon the principle of churning as used by ancient barbarians. I have often wondered when reading advertisements of toy engines that are made to give sufficient power to drive toy machinery, and sold for a dollar or two, why some enterprising manufacturer does not put upon the market an engine with sufficient power to do churning, etc. One that could be sold at from ten to twenty dollars. It seems to me that this could be done, just as well as a toy engine, with perfect working parts, can be sold for one dollar. What a boon such an engine would be to the common farmer. Is it lack of enterprise in the manufacturer that he does not put such an engine within our reach? When the glass in the lid of this revolving churn becomes clear, as it usually does after churning about twenty or thirty minutes, we stop the churn, the butter is then in the granular state, any longer churning is a perfect damage. The butter is then drawn off and strong brine put into the churn; this cuts the butter milk, which is drained off, and the butter may be either removed, or else salted and worked in the churn simply by turning the crank. Of course I am not asked, nor expected to tell, how to make good butter, nor to tell why it does not pay to make it on the small farm. In order to know how to make it pay, it is necessary to know the reason why it does not pay. To illustrate this point we will take two farmers' wives. Mrs. A. is a neat, tidy woman, who keeps everything connected with the dairy sweet, bright and shining as a new pin. She is ambitious, and everything she takes to the villag grocer is an A No. 1 "gilt edged" article, having the rich aromatic nectar of clover blossoms. At the grocery she meets the slatternly Mrs. B., also with a pail of butter, that, as the grocer uncovers it, sends forth its perfume suggestive of the cowstable, soap grease and dead rats. The merchant knows in his heart that Mrs. A.'s butter is worth three times as much as Mrs. B.'s but he pays each one the same price. It would never do to pay Mrs. B. less than the market price, because her husband is a good customer that it would not do to offend and lose, neither would it do to pay Mrs. A. more than the market price for her superior article, because Mrs. B. would declare that that "stuck up thing's" butter was no better, and no cleaner than was her own; and the merchant—well, he would know better than to create "a scene" at his store; so both women go home, and over the next batch of butter they make they soliloquize about as follows:

Mrs. A. will say, "Oh, what's the use, with all my care and extra work, in making a good and clean article, I get no more for it than does Mrs. B., who just holds up the rats by the tail, when they fall into the cream, and strips off the cream into the can? What's the use? slap her down, and down it goes; butter is only butter anyhow," and Mrs. B., encouraged that she gets just as much as the woman that thinks herself "somebody." and fusses over the butter, of course keeps on the good old way." This is why buttermaking on the small farm does *not* pay. Now, for the encouragement of just such a woman as Mrs. A., to make dairying pay on the small farm, let her hunt up some family in some town that she knows are particular in what they eat, let her commence furnishing them with butter even if she can get no more than the ordinary price for poor butter. Let her try her utmost to make each churning as good or even a little better than the last, and, particularly, let her invite the family to come and visit her. That has a great deal to do in the matter; most people like to know and to see where the butter they eat comes from. After a while her butter becomes an absolute necessity to that family. They cannot "for the world" eat any other, and if she is regular in her supply, she has command of the situation, and can fix her price at enough to make it pay. Certain it is that selling butter, or rather trading it to the store, never did and never will pay. The very nature of the case encourages the making of a poor article, and discourages the making of a good one. Whether the coöperative creamery would solve the problem of "how to make dairying pay on small farms" would, in my opinon, depend upon the character of the patrons. Perfectly conducted, undoubtedly butter of more uniform and better quality could be made, and sold for considerably more than could be realized for butter made on the farm. And I think I am safe in saying that the day is not far distant when the family churn will be stowed away to keep company with the ancient spinning wheel, and the coöperative creamery will tell "how to make dairying pay on the small farm." Of course the degree of success in the dairy is largely influenced by the kind or breed of cows you keep. For buttermaking, no difference what kind I had, I would aim to improve them largely by the infusion of Jersey blood. Their feed would also be one of the largest and most important factors to be taken into consideration. It has been said that if a cow in summer, by feeding a grain ration, can be induced to yield any more milk while running in pasture, "it only proves that there is something wrong with the pasture." I know, however, that she can be induced to yield richer cream and more butter by the addition of a grain ration, no difference how good the pasture is, the only question is, is it profitable in the long run to drive at such high pressure. I know of nothing in the fall of the year that makes nicer, better and more butter, and that is better relished by the cows, than half a bushel per cow of fine cut field pumpkins after the seeds are taken out, with four quarts of wheat bran, one quart of corn meal, and a little salt sprinkled on them. But pumpkins, as usually fed by the wagon load hauled out for the cows to gnaw at and gorge themselves, are productive of more harm than good. Field turnips, as well as pumpkins, can be cheaply raised. They come very handy to feed the cows whilst undergoing the change of pasture to dry feed in the stable. For this purpose they are far more valuable than we give them credit for. The chief objection against their use for milch cows is they impart their flavor to the milk and butter when not properly fed. But when fed immediately after the cows are milked, you can feed all the *turnips* you wish without the least danger of imparting turnip flavor to the milk and butter. Be sure, however, before giving them turnips, that they are milked perfectly clean, as a very little milk left in the bag of one cow, when mixed with the rest of the herd, spoils the whole of it. As cold weather approaches, I find there is nothing better for a milch cow than a large pailful of warm slops. And right here is room for the exercise of good judgment, as well as for the indulgence of a great deal of foolish talk, as to the proper combination of different brans and meals, or as to which one, separately, would produce the best results when fed either in the dry state or made into slops.

If any one has finely ground cornmeal, chopped oats, wheat and buckwheat bran, all mixed in equal proportions, and would twice a day stir from four to eight quarts of it into a pail of warm water for each cow, he would not go very far wrong.

If he would use either of them separately he would not commit an unpardonable sin. And if he had but a single pint of it and would, with the addition of a little salt, stir only that much into a pailful of warm water, the milk pail, as well as the grateful look of the cow would, during cold weather, soon convince him that there is more virtue in warm water than he had been aware of. Of course it is understood all along that in addition the cow shall have all the early cut clover hay she can eat up clean. Towards spring the cows will begin to hanker after grass, then is the time to commence on the mangles and sugar beets, to prepare them for the change from dry feed to grass again.

Whether to turn them out to pasture or to adopt the "soiling system" would seem to depend on the amount of help you have. I am quite certain, taking into consideration the amount of manure made and saved, the opportunity afforded for enriching the farm and increasing its capacity for carrying more stock, which means more manure, that I am safe in saying that in no other system or department of the farm could hired help be more profitably employed. Still another and very important factor must be taken into consideration to make dairying, as well as every thing else, pay on the farm. We must watch legislation that the oleomargarine law is not repealed, see to it that its provisions are strictly enforced. I do not believe in raising the cry of "protection to our infant industries" against free, fair, open and honorable competition, no difference what part of the world that competition comes from; but I do believe that we have as good a right to demand protection against the fraudulent counterfeiting of its butter as its money. The time has come when it is absolutely necessary for us to take a great deal of politics into our discussions. For once in the history of our Government the farmers and dairymen have scored a decisive victory over fraud and wrong. The great danger now lies in resting in fancied security, whilst an ever active and vigilant enemy is constantly plotting to turn our victory into defeat. If, in our blind and partisan zeal, we fail to put tried and true men on guard; if, instead of being arrayed together against our common foe, we continue our proverbial folly of arraying ourselves against each other, scratch each others eyes out, neutralize our strength and let our enemy gather up the spoils; then ask me not how we shall elevate and dignify the farmers' calling. Ask me not how we shall dignify labor, nor how we shall make dairying pay on small farms. If it is not already apparent, simply ask how we shall give ourselves the worst kind of a kicking.

The president here appointed the committees for this session.

A MEMBER. I would like to know the best feed to produce the greatest amount of cream?

Prof. ARMSBY. I do not know that I can answer that specifically. It is possible to make a great many proportions for such purposes, according to the material a man has to feed. The principle upon which those rations may be made up is all I can undertake to give you now. For milk production a cow weighing a thousand pounds needs to have in her food certain amounts of certain digestible matters. There are three classes of substances which she needs. In the first place, she needs albuminoids to keep her machinery in operation; in the second place, to produce casein of the milk from, she needs a certain amount of starchy matter and fat. We can lump these two together. They are to keep her warm, fuel food in the first place; and in the second place for the production of fat and the furnishing of milk sugar. She should get in the course of twenty-four hours in her food, about two and one-half pounds albuminoids, and about thirteen pounds starchy matter, and fat fuel food. Any mixture of fodders which will supply that will be a good ration for milk production.

There are tables which show how much albuminoids and starchy matter certain foods contain. Taking those tables you will find that bran contains ten or twelve per cent. of digestible or starchy matter. Taking those figures you can get at the mixture. At the same time there is this to be said in regard to that, that, as a general rule, is not specified. They tell you that such, and, such a mixture of corn, bran and oats would be good. Well and good, if it be so. But it does not help the man who wants to feed corn meal or cob meal. This is the method of calculating foods and it would take an address to explain it. It is a general rule which can be applied in all sorts of circumstances. Give a good quality of clover hay and you will find any mixture good feeding stuff. Such a mixture, corn meal, half-and-half bran, or a corresponding mixture will ordinarily give, if not the very best results, at least good results. I am coming to the belief that it is more the quantity of feed than the mixture, assuming, of course, that the feeds are wholesome and not in any way unwholesome in composition. That, of course, must be regulated more or less by the capacity of the animal in the first place, the capacity for eating and digesting in the second place. On the other hand when you come to use foods like oat meal or glutien meal which are rich they should be fed in small quantities. I should mix corn meal and bran; corn meal is too starchy. In general, you get more milk on the whole of better quality, at least as good in quality and a larger proportion of protein, up to reasonable limits. You should increase the quantity and probably the quality again by feeding wheat or rye bran, or by feeding a moderate quantity, two or three pounds a day, of corn or glutien meal, which are still richer.

Then it comes again to profit. By feeding expensive food you may not get enough to pay the expense. The quality of milk would depend very much upon the cows, and only subordinately on the feed. You will get about the same quality of milk within reasonable limits. You are feeding your cows for profit, and so that they will do their best. If you do that you will get about the same quality of milk under all circumstances. Any change you make would not make the milk better.

A MEMBER. What is the effect of feeding ensilage?

Prof. ARMSBY. About the same as feeding any other fodder. Ensilage has no particular effect upon the quality of the milk. It neither injures nor improves it. As a general rule those who feed ensilage are apt to sometimes insensibly drift into a practice of more liberal feeding. They are apt to give their cows more liberal feeding and perhaps get better results. It has been said that in many cases the silo got too much credit and the corn crib too little.

Mr. SIBLEY. Perhaps some considerable experience for a number of years back, in endeavoring to get special quantities of cream by tests in a large dairy for a number of years, has taught me something that might help our friend solve his problem as how to get the greatest amount of cream. You make the trotter before the horse is born if you would make a trotter out of a horse. If a person wants a great yield of cream or butter from any cow this. coming summer do not think you can put off feeding the cow until next summer. The butter and cream is being made now. Some one spoke about training animals for tests. It is in the development as it is in the horse. If a cow is giving 14 or 16 pounds a week, and you commence to increase the feed, you will have it in six weeks. You will at that length of time see the increase, and perhaps that yield will be maintained all the balance of the season. If I had the cows he has, and wanted to get the greatest percentage of cream, I would commence feeding now. I think this method of starving during the winter and especially when you are sending the milk to the creamery is a mistake. I do not know anything about cheese, but if the solids should bear the same proportion through the milk it is the same with cheese.

Prof. ARMSBY. The idea is to feed your cows good all the time, and they will pay.

A MEMBER. I would like to ask the professor, is it not an advantage to grind the corn, cob and all, or would you shell the corn and grind it?

Prof. ARMSBY. I do not think the cob will do the meal any hurt. If you grind them together you will save the labor of shelling; moreover there is more or less nutriment in the cob, which is a nutriment of a starchy sort. The main question would be the balance of cost between the cost of shelling, considering the cost, if any, of grinding the cob with the corn. I do not think it helps or injures digestion.

Mr. EDMUNDS. I think if the gentleman will take the amount the miller charges for grinding the cobs and will lay it out in wheat bran and feed with meal, he will have better success.

A MEMBER. I have tried the cob meal, and from the product you get plenty of milk, butter and flesh. I may state horses and cows will eat the fresh cob if there is no corn on it. You could not tell that there is any cob in the meal after it is ground.

Mr. CUTSHALL. It does not cost half as much to shell the corn as it does to grind the cobs. It takes two or three times as much power to grind the cobs. The gentleman speaks about eating the cobs. They hold your mill-stones apart so you cannot grind properly. I used to mill, and where the mill ground that way it did no good. I do not do that any more. I like the use of soft chop. Especially those little lances made out of the cob are hurtful, and about as mean a thing as you can give to young animals. I would not approve of grinding cobs at all.

A MEMBER. I have fed corn in that way forty years. Take it for cows, horses and stock about the place. I like to mix the grain, but with oats ground. I think there is more stock in this country hurt for want of that kind of food than there is with it.

A MEMBER. Three years ago I had some experience with a cob-mill. I started in to fat six steers. I got the corn shelled; had it ground and fed them the clear meal, and I do not believe the steers weighed as much as when I started. After that I got the corn ground cob and all, and calculated I could feed as much again.

Mr. CUTSHALL. That is not the way to commence feeding the meal. You should have fed something along with the meal, and it would have been better. Steers will always shrink under such circumstances. They will weigh less after the first month. I think the cob is very expensive to grind.

Prof. ARMSBY. In connection with this question of corn cobs I thought it might be interesting to call attention to some of the different ways of handling the corn crop. I understand that one of the ways coming into practice at least in the Western States. After the corn is cut it is separated and put together again. This leaves the corn dry and it can easily be run through the cutter or put into the silo. I do not believe in threshing corn with the machine.

A **MEMBER.** I have had a little experience in cutting corn, and I would advise all feeding cows on fodder not to go to the expense of husking and shelling and grinding. It is all lost labor.

Mr. **HOARD.** I have been experimenting with corn for a good many years. Thirty years ago I had dairy cows and discarded timothy hay for corn-fodder. I have gone back to the flesh pots of Egypt several times and yet I have made up my mind I had better stay by the Moses of my latter salvation. It is my candid confession that timothy hay is the poorest hay on God's earth for butter—the most costly. On a little piece of ground where I live, as an experiment, I raised four tons of pure corn-fodder, and in such a drouth we never saw in the State of Wisconsin. I cut it in August, and we had it the 15th of November. I saw on this same field four loads of timothy hay taken off where there was twenty tons the year before. In my experience corn-fodder has proven valuable. After a good many years now we have got to face this question of cheap ration. We have got to reduce the cost of keeping our cattle; we are coming to the question of reducing the price of our dairy products.

A man that I coaxed to plant twelve acres of Southern ensilage corn, came into my office with his hands uplifted and says, " My God, Hoard, what am I going to do?" "What is the matter?" "Twelve acres of that stuff, twelve feet high, and I don't know what to do with it; my hired man and I cut there one whole half day and did not cut a half an acre." " Well," said I, " Heaven bless you, are you going to fodder by the ton or by the acre?" " Well," he says, " I never thought of that." It is so easy for a man to hold a cent so close to his eyes that he will swear there is no man beyond. It is so easy for a man to submerge his head and let his heels stick out where folks can see him, yet think he is out of sight. We have gone on in this way, never challenging the fact of our existence, never challenging our methods, never challenging anything, but because our grandfather went to work in the hay field, and worked and tugged and piled up hay in the fall that he could get just as much for in the fall as in the spring, we have done it. We have gone on and never challenged it. In the West, whether Pennsylvania understands it or not, Wisconsin does understand it, and she does not propose to be caught in that way any more. As a result of our farmers' institutes, five hundred and fifteen silos have been built. There were 56,000 more acres of fodder corn planted last year than the year before, which absolutely put into our hands feed of the value of 200,000 pounds of hay. Where would we have been if we had stuck up for timothy hay. In regard to the silo, I have been getting a number of reports from all over the North-west, Illinois, Iowa and Wisconsin, and every man that has given it intelligent thought says his ration is costing him this year fifty per cent. less than it ever did before, with silo fodder corn. I believe, to-day, we can make a pound of butter for nine cents, and on a ration, in the old-fashioned way, that would cost $16 or $17. I remember Mr. Sibley said once that his fodder cost him $12 per cow. A cow can be kept in the way I speak of for $30 a year in Wisconsin. You ought to look this question squarely in the face.

The silo is a great blessing. You should plant your corn as early in the year as possible. Do not be afraid of the frosts in the spring. I would rather have two frosts in the spring than one in the fall. I find men that are fearful of getting their corn-fodder in too early. We turn over the ground in the fall, first selecting quick soil, and plant as soon as it can be put into the ground in the spring, and break it up before it is up with a slanting tooth harrow, drag it; do not stand around speculating that it is going to be dragged out of the ground.

Then we drag it two to four times to kill the weeds. It will check the corn a little, and it commences to make a strong root. The dragging is very light. You only want the tooth of the harrow in a little more than an inch, but if it is a slanting-tooth drag it would not hurt your corn. Then cultivate it nicely. When it comes time, cut it when the ear is just in the milk, it is then at the highest stage of excellence; a little ear on each stalk. You do not get good results with a cow unless you renew her maternity. When you cut this corn at this stage you do not want a silo. Then your stalk is at the highest pitch of excellence. You can cut it and lean it up against a board nailed to posts, until you have cut sixteen rows, and let it stay there all winter.

I can get more butter out of a ton of corn-fodder than I can out of the best ton of timothy hay I ever saw. If we can raise from five to seven tons of corn-fodder from an acre, what under the sun are we throwing away so much land on timothy hay for?

A Member. How do you propose to feed it; cut or whole?

Mr. Hoard. Cut it. Haul it in and pile it on the barn floor, cut it about half an inch, and you can cut enough to last two or three days. It will take $160 to put in a tread power, and it is the best thing in the world to take the tuck out of a bull. I think a half an inch is about right to cut it.

A Member. Did you ever try threshing?

Mr. Hoard. No; I never did, but I have been watching threshing this fall with interest. I have been writing for reports, and the reports are various. There is a good deal of danger of mold.

A Member. Have you had any experience in cooking?

Mr. Hoard. Not of late years. Several years ago I made some experiments. I do not understand that I got any more milk. I may state one thing on the value of warming water for my cows. I have no doubt that it is beneficial.

A Member. How warm would you make the water?

Mr. Hoard. About sixty-five or seventy degrees. It is very hard to get some cows to put their noses into cold spring water. It will not run over ten rods before it is frozen. With five cents worth of soft coal I can warm water for a herd of fifty cows. I have demonstrated it to my own satisfaction.

The silo is the most economical form of preserving food in the world. I have known of men putting in the corn-fodder whole.

(Here followed the oft-repeated manner of building silos.)

EVENING SESSION.

President Phelps in the chair.

Discussion on losing calves by cows slipping; also in regard to clover hay, and cobs and fodder.

MORNING SESSION—FEBRUARY 2, 1888.

Meeting called to order. President Phelps in the chair.

Prof. H. E. Alvord, professer in the Massachusetts Agricultural College, delivered his address:]

DIFFERENCES IN DAIRY PRODUCTS.

By HENRY E. ALVORD.

Milk is a fluid, and has been so regarded from time immemorial. It has been bought and sold by liquid measure. And in referring to the use of milk it is ordinarily spoken of as a fluid. We say commonly that we drink milk, and rarely speak of eating it. Yet milk is food rather than drink. It is the perfect food provided by nature for the young of the most important grand division of the animal kingdom. And we know it is largely consumed as food by human beings of all ages. It is, then, as a food that milk, and chiefly the milk of the cow, is so conspicuous in commerce and in domestic economy. But our first idea of human food is a solid substance; and although some food appears in a liquid form, it is valued for the solid matter it contains. Milk is no exception. It is a fluid because largely composed of water; but all its other constituent parts are solids, and they are what give milk its food value. Some of these constituents, the curd or casein, the sugar and the salts or mineral matter, are dissolved in water; other parts, the fats, are in semi-solid particles, held in suspension in the fluid, causing the opaque appearance. So milk is at once a solution and an emulsion. (By "emulsion," a word itself meaning milk-like, we intend to describe a physical mixture of different substances like oil and water, which do not form a chemical union.) To thoroughly understand milk, its composition and value, it must, therefore, be examined chemically and physically.

Chemical examination reveals the fact that milk varies greatly in its composition, or, rather, in the relative quality of its parts. By carefully evaporating the water we secure all the other parts, and these collectively are called the "total solids" of the milk. The fat may then be easily separated from the rest and its quantity determined, the remainder being what are known as "the solids not fat." These, in turn, are usually separated into casein, sugar and salt, or ash. The notable differences in milk are in the proportion of fat to other solids, and of the total solids to the water. The range of total solids is from below 11 per cent. to above 20 per cent. It is unusual, however, to find pure milk from a healthy cow with much less than 12 per cent. solids, and over 16 per cent. is also uncommon. The highest record found for a single cow is 23.43 per cent., and the lowest, 10.55 per cent., the former a Jersey and the latter a Holstein; and the highest for a herd, for any length of time, is 15.45 per cent., for a herd of registered Jerseys in the State of New Jersey, tested for one full year, and the lowest, 11.77 per cent., for forty-five Dutch cattle at Proskau, for over two years, as reported by Dr. Schmoeger in the "Milch Zeitung," for 1881. The range of fat is even greater, proportionally, being from 2 per cent., or even less, to 12 per cent. But 3 per cent. is as low as allowable for pure milk from a well-kept cow, and everything over 6 per cent., maintained for any length of time, is very rare. The fats of milk being included in the solids and the most variable portion, we naturally find most fat with the most solids, and the lowest fat with the lowest total solids, and *vice versa.* The highest and lowest records of fat which I have seen for single cows are 12.53 and 2.70 per cent., being the same animals previously referred to as showing the extreme for total solids. Both were examined at the New York Agricultural Experiment Station. The highest and the lowest for a herd, 5.53 and 2.82 per cent., respectively, for Jerseys and Holsteins.

Physical examination, chiefly with a microscope, shows the condition in which the fat is held in the serum or fluid, and demonstrates great differences, in this particular, in the milk of different cows. The fat is found in globular form, myriads of these minute globules floating at will, in the otherwise colorless fluid, and giving to milk a physical character and quality quite distinct from its chemical quality. The main differences in these fat globules are in their average size and their uniformity of size as seen in different milks. It requires from 1,500 to 10,000 of these fat globules, placed side by side, to cover an inch in length; from 6,000 to 7,000 is a fair average. Sometimes, but not often, globules are found as large as $\frac{1}{1000}$ of an inch in diameter, and in most milk there are those so minute as to be called granules, [to distinguish them, and which are $\frac{1}{25000}$ of an inch, or less in diameter. Dr. Sturtevant, as the result of thousands of examinations, reported the everage size of the fat globule in Jersey milk as $\frac{1}{5252}$ of an inch, and in Ayrshire milk $\frac{1}{7080}$ of an inch; the average size for Dutch or Holstein milk was still smaller. The larger the fat globules in any milk, the easier and quicker they separate from the fluid, and the more difficult it is to remix the parts; that is, the cream and the skim milk. I quote from Dr. Sturtevant on this subject of the differences in milk as regards its physical character: "The globule of the milk of the Jersey breed is larger than that of other breeds examined, and there are fewer granules; as a result, the cream rises with considerable rapidity, and so completely as to leave a very blue skim milk, which does not readily remix with the cream. The milk of the Ayrshire breed furnishes a globule intermediate in size between the Jersey and the Dutch, and a predominant feature is the presence of numerous granules, or extremely small globules, which give a white rather than a blue appearance to the skim milk. Of the three breeds we are considering, the Dutch or American Holstein presents the smallest globule to its milk. The globules are more uniform in their size than in the Ayrshire milk, and there are fewer granules. The cream, on account of the uniformity of size of the globules, rises completely, making the skim milk appear blue, and on account of their small size, the cream can be readily mixed with the skim milk by shaking." Prof. Arnold adds, on this point: "The milk of Devons closely resembles that of Jerseys; the milk of native cows is usually similar to that of Ayrshires, and the milk of Shorthorn cows somewhat resembles that of the Dutch, but the globules are larger and not so uniform in size and quality."

Investigations in another direction have determined what may be called either physiological or hygienic differences in milk. The character of the solids, and particularly of the fats and casein, appears to differ as regards digestibility. It is believed by some that the casein is more or less in a solid form, instead of all dissolved, and that this solid portion varies greatly in different milks. This variation makes one milk much more wholesome, or easier of digestion, than another, which becomes a matter of importance in the case of infants and invalids. Furthermore, milk differs in the matter of color. Some cows, as a part of their animal economy, have the power of secreting, in various parts of the body, an orange-colored pigment. This coloring matter has a special affinity for the fatty tissues, and appears in the fats of the milk. In this respect, as stated, cows differ greatly, and the matter of color seems to have no relation whatever to the quantity or other qualities of milk. It is certain that color is in no respect an indication of the quantity of fat in a milk, or of the butter that milk will produce. Erroneous views on this point have led to undue value being placed on high-colored milk and cows producing such. Repeated trials have shown that cows whose bodies and milk are destitute of this often-prized quality yield milk richer in the quantity and quality of butter produced from it than other cows specially selected for their high development of this peculiar attribute of color.

Although the variations in milk, as described, appear more or less among cows of the same breed, and more decidedly among animals of mixed blood, it has been well established that the contrast is most marked between pure-bred cows of the several recognized dairy breeds of cattle. The differences in the milk from these breeds is so positive as to be regarded as characteristic of the breeds themselves. Thus, high medical authority pronounces the Ayrshire milk to have special hygienic properties which adapt it, above all others, to the use of infants and invalids. The predominating feature of Guernsey milk is the deep orange color which becomes imparted to the butter. The cattle of Holland and Holstein are noted for yielding enormous quantities of milk, very low in fat and other solids, but of such physical character as to make it the best of all to transport long distances and maintain an even quality for retail city delivery. And the Channel Island cattle—the Guernseys and Jerseys—give the highest per cent. of fat and total solids, together with high color. *The differences which are to be found in milk and the products of milk are, then, mainly a difference of breeds.* The study of the characteristics of the milk of different breeds of cattle has, therefore, a direct practical bearing, and becomes of interest to all consumers who are discriminating buyers, and to all producers whose business sense leads them to take every advantage of a discriminating market. Heretofore there has been difficulty in pursuing this study because of the lack of sufficient data. In the old records, of which there is a great mass, we have widely varying results from the examination of milk, cheese and butter; but they are valueless as bearing on the question of breed, because rarely, if ever, do such records give any history of the origin of the substances examined. Facts of a more complete and satisfactory character have been accumulating of late years, however, and while it is not unlikely that further data will cause some modification of existing averages, and the deductions to be made from them, we have now enough to at least make a very interesting subject for study and to lead to some well-defined conclusions.

My attention has been attracted, for two or three years, by the discussions of human foods, and the different ways of comparing them. I have been specially interested in noting the high position occupied by dairy products as economical articles of food. And this paper was suggested by, and is mainly based upon, certain tables, with their explanations, which are to be found in the proceedings of recent meetings of the American Association for the Advancement of Science. Those relating to the differences of milk—or rather the variation in the food value of different milks, and comparing dairy products in this respect with other articles of food—were presented in the Economic Section of the Association, and the one on variations in butter was presented in the Chemical Section, and also contributed to the last meeting of the Society for Promoting Agricultural Science, and published in its proceedings for 1887. With such endorsement, we may rely upon the accuracy and value of these data, and may deduct some important facts from their consideration.

The tables to which attention is first invited were prepared two years ago, in connection with a discussion of "the food question," to illustrate the "Relative Values of Human Foods," upon the basis of their chemical composition. They have been amplified and rearranged within the past year, separating the long list of dairy products from the other foods, and giving a new title suited to my present use of them. (Table illustrating the differences in dairy products, and comparing the latter with various other standard foods.) The figures, as presented to the American Association, remain unchanged, and they represent a very large number of authentic analyses. In relation to every article named, the composition on which its value is based is the average of all analyses of like articles of undoubted history which could be found recorded, upon reliable authority, up to the first of July, 1887.

There are different ways of comparing human foods, upon the score of economy. If one attempts to consider at once their digestibility, chemical composition and usual cost, beside other conditions which should not be ignored,—nervine properties, for example,—the problem becomes very complex. It is hard to define the average human stomach, and we are so much in the dark on the questions of actual digestion and assimilation of different forms of food that it is safer to drop that factor than to include it. At all events it is better to approach the subject by stages; and in this instance we consider, in combination, the chemical knowledge of foods and their market prices. The basis of comparison is all important. The necessity is apparent of separating foods into two grand divisions, animal and vegetable, and of selecting a basis for each. It is needless to here fully explain the manner in which these tables were prepared. For the details, reference is made to the original form of publication. (Vol. xxxiv, Amer. Assoc. Advancement of Science, 1885, page 504.) The statement is sufficient, now, that pure lard, at 12 cents per pound, and average ox-beef, flesh free from the bone, at 16 cents per pound, taken as the basis, gives the average cost of the nutritients in animal foods as 72 cents per pound for protein, 12 cents for fats, and 7 cents for carbohydrates. This assumes the proper ratio between fats and carbohydrates to be 1.75 to 1; so that to combine these two, the quantity or per cent. of fat in any analyses is multiplied by 1.75 and added to the carbo-hydrates. For vegetable foods, the potato, at 60 cents per bushel, or 1 cent a pound, is the basis, and the value of vegetable protein thus fixed at 10 cents per pound, and of carbo-hydrates at 4 cents per pound.

Based upon these values, the following tables have been compiled. They give the chief nutrients, the computed value, and the average price, approximately, of 100 pounds of about thirty different dairy products, and, for comparison, an equal number of other common articles of food, one-third animal and the rest vegetable. A column is added at the right of each table, indicating by the signs plus (+) and minus (—), whether the usual selling price, as stated, is more or less than the computed food value.

Table Illustrating the Differences in Dairy Products, and Comparing the Latter with Various Other Standard Food Products.

MILK FROM VARIOUS DIFFERENT BREEDS OF COWS, WITH BUTTER, CHEESE, ETC.	Pounds protein in 100 pounds.	Pounds carbohydrates in 100 pounds.	Computed value per 100 pounds.	Average market price per 100 pounds.	Price, greater or less than value.
Cow's milk, chemists' standard,	4.00	10.62	$3 62	$3 25	— *a*
Cow's milk, average all analyses,	3.41	11.23	3 24	2 79	— *b*
Milk of Galloway cow,	5.36	8.86	4 45	3 25	— *a*
of Bengali cow,	5.19	10.07	4 44	. . . . .	—
of Devon cow,	4.37	12.56	4 02	3 25	— *a*
of Jersey cow,	3.98	13.88	3 82	3 50	— *c*
of Guernsey cow,	3.97	13.63	3 81	3 50	— *c*
of Brittany cow,	3.96	10.89	3 76	. . . . .	—
of Danish cow,	3.90	10.69	3 56	. . . . .	—
of Ayrshire cow,	3.76	11.65	3 54	3 25	— *a*
of Shorthorn cow,	3.74	11.83	3 52	3 25	— *a*
of Kerry cow,	3.40	10.96	3 21	. . . . .	. . . . .
of Dexter (Irish) cow,	3.35	11.05	3 20	. . . . .	. . . . .
of Holstein cow,	3.15	9.67	2 95	3 25	+ *a*
of Hollander cow,	3.03	10.65	2 93	3 25	+ *a*
of Fribourg cow,	2.84	11.68	2 86	3 00	+ *d*
of Dutch cow,	2.78	11.42	2 80	3 00	+ *d*
Goats' milk,	3.80	12.98	3 65	. . . . .	. . . . .
Sheeps' milk,	7.12	14.67	6 15	. . . . .	. . . . .
Skim-milk (cow's),	3.06	6.15	2 63	1 77	— *e*
Buttermilk,	3.78	5.89	3 13	1 77	— *e*
Condensed milk,	16.07	60.06	15 77	20 00	+
Cream, average,	3.70	48.51	6 06	12 50	+
Butter, average of all,	0.86	146.15	10 67	25 00	+
Butter, Jersey,	1.30	152.78	11 41	30 00	+
Butter, Ayrshire,	1.40	151.81	11 42	25 00	+
Butter, Holstein,	2.65	143.55	11 82	25 00	+
Cheese, full cream average,	27.16	55.78	23 46	15 00	—
Cheese, pure Jersey milk,	28.18	64.81	24 48	15 00	—
Cheese, half-skim,	27.62	38.92	22 61	12 00	—
Cheese, skim-milk,	32.65	21.50	25 01	10 00	—
Cheese, whey,	8.88	66.91	11 08	. . . . .	. . . . .

NOTE.—*a*, at rate of 7 cents per quart; *b*, 6 cents per quart; *c*, 8 cents per quart; *d*, 6½ cents per quart; *e*, 4 cents per quart.

Table Illustrating the Differences in Dairy Products, and Comparing the Latter with Various Other Standard Food Products.

STANDARD ARTICLES OF HUMAN FOOD.	Pounds protein in 100 pounds.	Pounds carbohydrates in 100 pounds.	Computed value per 100 pounds.	Average market price per 100 pounds.	Price, greater or less than value.
Beef, without bone—average,	21.39	9.08	$16 32	$16 32	—
Veal, medium fat,	18.88	13.89	14 57	15 00	+
Mutton, fat,	14.80	63.73	15 12	15 00	—
Pork, fat,	14.54	65.35	15 04	13 00	—
Fowl, domestic,	18.49	17.54	14 54	16 00	+
Hens' eggs,	12.55	21.74	10 56	10 65	+ *f*
Salmon,	13.10	12.67	10 32	30 00	+
Mackerel,	23.42	11.83	17 69	10 00	—
Codfish, dried,	17.90	2.25	13 05	8 00	—
Oysters,	4.95	3.27	3 97	10 00	+
Fine wheat flour,	8.91	76.12	3 94	3 00	—
Coarse wheat flour,	11.27	75.79	4 16	2 50	—
Oat meal,	15.50	74.37	4 52	3 00	—
Corn meal,	12.17	78.02	4 55	1 50	—
Fine wheat bread,	6.82	53.69	2 83	4 00	+
Coarse wheat bread,	6.23	51.32	2 67	3 00	+
Potatoes,	1.79	20.84	1 01	1 00	—
Rice,	1.81	76.61	3 24	6 00	+
Beans,	23.56	52.10	4 44	4 00	—
Peas,	22.63	56.25	4 51	5 00	+
Cabbage,	2.95	9.24	66	1 00	+
Onions,	1.68	10.99	61	2 00	+
Tomatoes,	1.25	4.66	31	2 00	+
Sugar, from cane,	0.35	96.73	3 90	6 00	+
Honey,	1.29	81.43	3 39	25 00	+
Apples,	0.39	13.74	59	1 50	+
Dried apples,	1.06	55.97	2 35	.....	+
Peaches,	0.65	12.57	57	.....	+
Strawberries,	1.07	8.48	45	.....	+
Grapes,	0.59	17.11	74	.....	+
Banana, yellow, hard,	1.41	30.85	1 23	.....	+
Banana, fully ripe,	4.82	20.96	1 32	.....	+

NOTE.—*f*, 16 cents per dozen.

Certain general explanations and remarks should be made in regard to these tables before referring to any special points of interest. In each table the first column gives the name of the article of food to which the figures on the same line apply. The remaining columns in the two tables are duplicates in their headings and objects. The column headed "Protein" gives in pounds and hundredths of a pound the average quantity found in one hundred pounds of the article named. By "protein" is meant that class of compounds, the most important of all the ingredients of food, whose four elements are carbon, oxygen, hydrogen, and especially nitrogen (with, perhaps, a little sulphur or phosphorus). Under the head of protein are, therefore, included what are variously called albuminoids, gelatinoids, nitrogenous parts, and proteids; the most familiar example of which is the albumen, or "white" of eggs. The next column, headed "Carbo-hydrates," gives likewise the quantity of this class of nutrients in one hundred pounds, expressed in pounds and decimals. These substances include sugar, starch, dextrin, digestible woody fibre, etc., which, as well as fats, are composed of the three elements, carbon, oxygen and hydrogen. It should be especially noted that in these tables, to save a column and simplify their appearance, special columns for fat have been omitted, and the fats have been included in the columns of carbo-hydrates, being first reduced to an equivalent on the ratio previously stated. This accounts for the apparent anomaly of the figures in this column, in some cases—butter, for example—indicating more than one hundred pounds of carbo-hydrates in a hundred pounds of the article named (!). The explanation is as given,—that the fat, having the higher nutritive value, has been multiplied by 1.75 before adding to the carbo-hydrates proper. The reason undoubtedly was, that the nutritive parts of food are commonly, if not correctly, classed as flesh-forming and heat-producing, or life-sustaining. Fats and carbo-hydrates both belong to the latter class, and hence are expressed in combination. In these tables, therefore, the protein columns represent flesh-forming parts of the food, and the carbo-hydrates columns, heat-producing. (It is a recognized fact that this last classification is defective in several particulars, but especially because the protein of food may be changed in the body into fats and carbo-hydrates, and serve, as do the latter, for fuel in sustaining animal heat and life.) These two columns are based upon fixed facts, determined by chemical research, and not liable to change, although slight modifications may result from adding new analyses, and the articles may, in the course of time, while maintaining the same name, acquire new characteristics. The next column, headed "Value," is based upon those before, with the rates assigned for protein and carbo-hydrates, per pound, in animal and vegetable substances, and thus gives the actual value of the nutrients in one hundred pounds each of the foods named, computed upon their chemical composition. If exceptions are taken to the assumed prices of the basic articles, it is manifest that by a simple calculation, based upon existing market rates, the columns of food values may be easily reconstructed to suit any given locality. As the figures stand, however, they are relatively correct, and serve our purpose better, in comparing different foods, than do those of the previous columns. The columns headed "Average Market Price" are simply for illustration, and will vary more or less with time and place. The purpose of the signs in the right-hand columns have already been explained.

It may be noticed that the tables do not include the mineral constituents of food, which are usually denominated the ash. No diet is complete without some mineral ingredients, and in milk for babes these are an important factor. But sooner or later after we begin to crawl,—and sooner rather than later,—we all, it is said, "eat our peck of dirt," so that this omission may be regarded as unimportant, and, perhaps, be thus accounted for.

For the single object of showing the differences in dairy products, and hence, for this occasion, we should have found it more satisfactory to place the fats in a separate column, and also have a column of total solids. But I thought it best to use the tables as originally published, rather than change any figures.

At this point, attention is especially invited to the demonstration given by these tables of the cheapness, when compared with their nutritive value of nearly all dairy products (butter excepted). Skimmilk, buttermilk and cheese at their usual retail prices, are cheaper as nutritious food, than any other article on the list, and are approached in this respect only by fresh mackerel and dried codfish. Butter is an exception, and, while it unquestionably serves special purposes in the human diet, it must, upon the basis of its chemical composition, be regarded as a delicacy or luxury, and not as a food. It ordinarily costs two or three times its real food value and often more. Of the more solid foods not specially perishable, nothing begins to compare, in cheapness, with cheese. What shall be said of the domestic economy of America, where more butter and less cheese are consumed, per capita, than in any other nation in our zone? And what of the wisdom of the lawmakers, in some of our States and great cities, who, to escape the difficulties of regulating the milk traffic, utterly ignore the vital question of cheap and wholesome food for the poor, and sanctioned even by boards of health, absolutely prohibit the sale of skimmed-milk, and actually authorize the destruction of all that can be found!

Now, let the consideration be confined to that part of the first table which relates to milk. Great differences are here shown in the composition and hence the value of the average milk of cows of different breeds. It is worthy of notice that the milks which, as shown in the column for carbo-hydrates, have the most fat, are, as a rule, also the richest in protein or curd. This table indicates at once the breeds of cattle whose milk we should buy, if consumers, and which we should keep, to be the producers of milk of high quality. The milk of the chemists' standard, "average cow's milk" (as determined by very many analyses), and of all the breeds enumerated, except four, usually sells for less than its computed value. Four breeds, all of the same general class of stock, yield milk so low in its nutrients that it is, on the average, not worth the prices at which it usually sells. This difference in value would be still more marked, if the same selling price was assigned to all milk, but special allowance is made in the table for higher prices for milk of exceptional richness and low prices for that of poorest quality.

Manifestly, we do not buy milk, and we are foolish if we produce it, for the water it contains. The greater the proportion of water the poorer, less valuable the milk. It is the solid portion, and that only, which gives milk its food value, and I firmly believe the time is near at hand when its commercial value will be fixed by the total solids. Indeed, a system of grading milk according to its solids, and selling it at different prices, fixed by its quality, has already been inaugurated by at least one enterprising milk-dealer in Philadelphia. To illustrate: Compare the milk of one of the breeds of high quality and one of those of a low standard with the general average. We will take the fourth from the top, the Jersey, and the fourth from the bottom, the Holstein, as being familiar breeds, and expand the figures of the table to give the following average analyses:

KIND OF MILK	Water.	Solids.	Casein.	Fat.	Sugar.	Ash.	Value per cwt.
Maximum Jersey, ...	85.18	14.82	3.98	5.06	5.03	.75	$3 82
Mean, average of all, ...	87.31	12.69	3.41	3.66	4.92	.70	3 24
Minimum, Holstein, ...	87.92	12.08	3.15	3.30	4.90	.73	2 95

A graphic illustration is more satisfactory than the mere figures.

Three sets of glass jars, six in each, can be prepared so as to show respectively the component parts of one gallon of each of the three grades of milk represented by the figures in the table just above, and thus strikingly exhibit the difference in composition of these representative samples of milk.

The question may be asked: Is not this theoretical? Not at all! Excepting the single item of the relative nutritive value of fats and carbo-hydrates, everything about these tables is fact—simply the condensed record on innumerable facts, determined by many careful men, working through a long term of years.

Is this not all scientific work? Yes, it is mainly the work of scientific men. But if the word "science," which to some is so repugnant, is, as it ought to be, interpreted as meaning simply the truth, or, as Davy so well defined it, as "common sense, refined and classified," there seems no reason why these records should not be accepted by the most "practical" man. While I have the most profound regard for science and scientific methods, I measure the value of both solely by their practical results. And I believe that the statements thus far made herein accord perfectly with practical experience. They are fully substantiated by the facts developed in the dairy farming of this country at the present time, and by its allied industry and commerce.

So far recorded facts. But now, when we come to a discussion of the lessons they teach, and seek for examples in practice, we necessarily reopen "the battle of breeds." Only facts which can easily be authenticated will be given, and comparisons will be fairly made, but it will be impossible to occupy strictly neutral ground. The question is: Which cattle produce the best milk—the best to sell and the best to buy? I will not attempt to further argue that the best milk is the most profitable, for seller as well as for buyer. We will take the most familiar rival dairy breeds, the Holstein-Friesians (as now called) and the Jerseys. According to the chemists, the average milk of Holstein cows has but 12.08 per cent. of solids, including 3.30 per cent of fat. This would barely escape the lowest legal standards that are justifiable. It will readily be understood that the *probability* is, that more of the milk of cows of known breeding has been from animals above the average quality rather than below. Do practical results sustain the testimony of chemistry? Within two years I have personally known of two herds of highly-bred Holstein-Friesian cattle, many of them imported, and valued as better than the average of their breed, owned in two different States by men of absolute integrity, and yet both these owners have suffered the penalty of the law, because the milk sold from their herds, and which they insisted was pure milk from their fine cows, fell below the local standard in their respective States. The case of Uriah Borten, of Rancocas, N. J., the facts of which have been given to the public, is another of a similar nature. I know of the case of a substantial dairy farmer who made his whole living from his farm, and who sold off a profitable dairy herd of mixed blood and replaced them with Holsteins, in which he invested all his savings. He did well in the sales of cattle, became a large importer, and one of the most highly esteemed expert judges of the "blacks and whites" in his section of the country. Lately he surprised his neighbors by selling out his pure-bred cattle, stocking his farm with grade Jerseys, and resuming his old dairy business. Upon being asked to explain, he stated that he was unwilling to continue selling to other people, as fine dairy stock, animals which in his own practice had proved to be unprofitable; that he had lost, by keeping Holsteins as his dairy herd, about as much as he had made trading in them, and resolved to return to stock that could be kept at a profit. Another case, with the details of which I am familiar, is this: A man, whose name you would all recognize, owns a large farm near one of our principal cities, well adapted for milk production. He had a stock of Jerseys and grade Jerseys, and mixed-bloods, or "natives," and bought a good milk route, on which he disposed of their products. The demand soon exceeded his supply, and upon the advice of friends, he purchased Holstein-Friesians to increase his herd. Fancying the fine, large animals newly acquired, and having ample means, he sold off all but three or four of his Jersey cows, and, with this exception, stocked up entirely with Holsteins, buying at high prices from several of the most celebrated breeders in America. Almost immediately his milk route began to run down, and he had nearly lost his whole trade before he became satisfied of his mistake, and began to sell Holsteins and buy Jerseys. Now I see his name, every few weeks, as the buyer of registered Jerseys, from the most noted deep-milking families. I was lately told by the farmer of this gentlemen, that the latter had become fully convinced as to which breed of cows gave the best milk, and were the ones best adapted to a profitable milk-selling business. Our table gives, for average Holstein milk, total solids, 12.08, and fats, 3.30. Not long ago I saw the record of the analyses of twelve samples of milk, from five exceptionally fine Holstein cows—none better anywhere—and one or more being at the time of examination specially fed to produce rich milk for a butter trial. The work was done by an eminent chemist, and the average result was, total solids, 10.93, and fats, 2.84. Analyses of the milk of a herd of Holsteins near Philadelphia, given by the owners, in 1884, averaged for total solids, for April, 11.33; May, 11.59; June, 11.64—all on liberal rations of substantial and good milk-producing food. At the State Experiment Station in Wisconsin, examinations of Holstein milk gave total solids, 11.28, and fat, 2.88. For three consecutive years, at the Royal Dairy Show in London, the milk of the Holsteins exhibited has been tested and found to average, total solids, 11.80, and of this 2.97 per cent. was fat. Such milk cannot be sold under the laws of the State of New York, outside the county in which it is produced.

Let us see if milk of a better quality cannot be found. The chemists' average for Jersey milk, according to our table, is for total solids, 14.82, and for fats, 5.06. As before remarked, this may be a little high, and for the reasons stated. But I have in my possession the record of more than a year, of weekly tests made of the milk sent to Philadelphia daily, for sale, from a herd of registered Jersey cows, owned by Mr. H. Lippincott, of Cinnaminson, N. J. The dealer who receives this milk, on some day in every week, according to his fancy, samples the milk and has the total solids chemically determined. The record for the herd for a year just closed, shows a range from 13.13 one week in June, to 16.16 in January, and an average for the year of 14.76 per cent. total solids. This comes pretty well up to our standard (only $\frac{6}{100}$ of 1 per cent. short) and the record would undoubtedly have been higher but for the fact that a full half of the herd were heifers with their first calves. In passing, it may be well to notice that this record shows what always proves true, that the lowest per cent. of solids in a year is at the flush of June pasturage, and during the heat and flies of July and August, and the best milk is from good winter feed. Mr. Lippincott's monthly averages were as follows: June, 14.10; July, 13.83; August, 14.03; December, 15.21; January, 15.46; February, 15.19. There is a still better record for a whole year. The dealer who handles Mr. Lippincott's milk also has the product of Mr. John P. Hutchinson's herd of registered Jerseys, at Georgetown, N. J., and has made similar tests of that milk. Although the details are not given, this dealer, Mr. George Abbott, Jr., of Philadelphia, informs me by letter that for the entire year of 1886, the milk from Mr. Hutchinson's herd averaged 15.45 per cent solids. This is more than one-half per cent. above the standard of the table. He adds, as further examples, the following averages of solids, for the year 1886, in the milk of certain herds handled by him, and says, "These are first-class *representative* herds of the breeds named, and the averages are for the entire year": Registered Jerseys, 14.37, 14.49, 14.77, 14.80 and 14.93; registered Guernseys, 14.61, 14.68 and 15.14 per cent. The average of the ten herds examined by Mr. Abbott is 14.80, which is a practical endorsement of the table, or the average as fixed by science.

During a long period of close observation at the New York Agricultural Experimental Station, where the milk from several unregistered Jersey cows was tested daily, the total solids averaged 14.45, ranging from 13.70 to 15.90. During the trial a great variety of food was used, sometimes being intentionally poor. Unfortunately, the percentage of fat, as distinct from the other solids, was not taken; but one may always be certain that where the total solids run above 13½ per cent. the milk is rich in fats, for instances of "solids not fat," above 10 per cent., are very rare. While at Houghton Farm, I had the milk of Jersey cows not regularly but repeatedly examined. The solids ranged from 13.72 to 15.96 per cent., and the fat was never found below 4.30 in the milk of the herd, while it sometimes reached 6.61 per cent., and averaged 4.93 per cent. So much for the quality of the average milk of good business herds of dairy cows.

The impression prevails in some places, that while the milk of Jerseys is of a high quality, it is always in small quantity per cow. This is rather outside the bounds of my present subject, but I will venture to briefly notice this point. The criticism is not sustained by the facts. The habit of an even and long continued flow of milk, which is one of the most valuable characteristics of this breed, and of great importance to the producer of milk for sale, results in much larger annual records of milk product in good dairy herds of Jerseys than they are generally credited with. One year while I was at Houghton Farm a herd of fifteen, including two aged cows and three undeveloped heifers, produced an average of 5,844 pounds 3 ounces, or 2,718½ quarts per head. It is very well known that dairy herds, kept for the quantity of milk produced, but with little regard to quality, and maintained by frequent culling and purchases of fresh cows, are considered as doing well to average 2,800 quarts per cow, or 6,000 pounds. Herds capable of an annual yield of 3,500 quarts, or 7,500 pounds a year, to every cow fed for the year, and which in quality reaches the New York standard, are exceedingly rare. Yet Jersey herds, maintained by their own increase, are by no means uncommon, which average over 6,000 pounds of milk a year, and that of the highest quality. Mr. A. B. Smith, of Eagle, Michigan, in the year 1885, had a herd of ix pure Jersey cows and three high-grade Jerseys, which averaged

7,100 pounds of milk each. The large herd of registered Jerseys, at Deerfoot Farm, Massachusetts, where the daily record of every cow has been kept for fifteen years, shows a total average of about 1,500 quarts or 5,400 pounds per head for this long period. Single cows in this herd averaged 2,933, 2,941 and 3,371 quarts a year for seven successive years, being from 6,200 to 7,250 pounds. The Echo Farm, at Litchfield, Connecticut, have published a list of the names and numbers of a dozen of their registered Jerseys, several of them ten or twelve years old, with their yearly milk yield, which averages for the lot 8,385 pounds or 3,900 quarts. Messrs. Miller & Sibley, of Franklin, Pa., have taken pains to purchase and breed Jersey cows of large milking habits, and, as showing their success, they publish the records of twelve cows which averaged for a year 8,700 pounds or over 4,000 quarts of milk each. One heifer with first calf gave 10.101 pounds in twelve months, before three years old; another young cow gave 10,329 pounds on ordinary feed; and an older one, 16,153 pounds, or an average of 20 quarts a day for the whole year. That this last yield was milk of good quality is sufficiently proven by its making over 927 pounds of butter, or a pound of butter to every 8 quarts of milk. These facts show that there is no trouble in getting Jersey cows whose product is large in quantity as well as high in quality.

A letter recently received by me from Mr. Edward Austen, of Filston Farm, Glencoe, Maryland, is appropriate in this place. I requested this gentleman to send me the annual yield of his cows, and what he knew of its quality. Mr. Austen is a man of accurate, systematic habits, who, after some years in business life, now owns and manages in person a dairy farm in Maryland, producing milk for sale in the city of Baltimore. He once said to me that he found the only safe milk business was making the best milk, and he would not keep a cow in his herd that did not prove profitable as a dairy animal. But his letter tells the story: "Twenty cows in my herd of A. J. C. C. Jerseys, being all the cows I had that had dropped more than one calf, yielded 119,495 pounds 14 ounces of milk in twelve months, being an average of 5,974¾ pounds for each cow, and every one of these cows bore a calf during the year. The milk of every cow was weighed separately, morning and night, every day except Sunday, when the yield was assumed to be the same as that of the previous day. Calves were allowed to suck their dams for three days and no estimate made of the milk so used. Eight of these cows were imported and the others home-bred. The lowest record of the year was that of an imported cow, over twelve years old, 4,181 pounds 6 ounces; and the highest was a home-bred cow, 8,383 pounds. I have only made two butter tests for seven days among these cows. One gave 16 pounds 12 ounces and the other over 14 pounds of butter, both on a trifle more than the regular dairy rations. I made quite a number of tests of one to three days, on the regular feed, and was quite satisfied that there was only one cow in the twenty that would not make over 10 pounds of butter per week on their regular daily food, and that a majority of them would go over 11 pounds. I have no other means of ascertaining the quality of the milk produced except the cream glass, which, used daily, showed from 19 to 31 per cent. of cream,—whatever that may prove. If we had an Agricultural Experiment Station in this State, I would know the per cent. of fat and total solids. I have always, since my boyhood, been a lover of cows, and began with Devons; then tried Ayrshires, and finally Jerseys. For all dairy purposes I shall stand by the latter. The Guernseys stand high in my estimation, but I have reason to think that they are not such persistent milkers as the Jerseys. You did not ask my opinion of Jersey cows, or the respective merits of the various breeds, but I throw this in."

Good cheese is made from whole milk, or that from which no part of the cream has been taken. In old times little else was thought of. Now so many inferior kinds are made that the designation "full-cream cheese" is given to the standard product of first quality. The difference in this class of dairy products, to which I shall briefly refer, are not those incident to the processes which result in "skims" and "filled" cheese (lard or oil substituted for fat removed in cream) but relate to the variations occurring in the quantity and quality of full-cream cheese mode from an equal weight of whole milk from different breeds of cows.

One would not at first think that milk of extreme richness of fat or cream, and specially adapted to buttermaking, would be desirable for cheese. But in well-made cheese, a very lage share of the total solids of the milk are secured in the product—nearly all the casein and the fat, although most of the sugar escapes in the whey. Consequently, that which is richest in total solids will make the most cheese per hundred weight of milk; and the general statement is true, that milk best suited to butter is most profitable for cheese. The data regarding cheese made from the milk of pure-bred cows of different breeds is meagre, but the principle stated is borne out by experience with Jersey milk. The general average in good cheese-making districts is ten pounds of cheese to every hundred-weight of milk; with milk from pure Jerseys, in large number, on the common factory plan, it has been found that the same weight of milk will give over twelve pounds of cheese, a gain of more than twenty-five per cent. in quantity of product. At several public exhibitions in Canada during recent years, and also at the Ontario Experiment Farm, the milk from selected cows of different breeds has been tested in various ways, and among the rest with reference to the available curd or cheese-making qualities. (The animals being few in number, I do not regard these results as alone settling any points of comparison, but they may serve in corroboration of other statements made.) The details have been widely published, so it is sufficient for present purposes to state the general results. The order of merit as cheese-makers indicated was as follows: 1st trial, Jerseys, Shorthorns, Ayrshires, Guernseys, Devons, Galoways, Holsteins, Polled Aberdeens; 2d trial, Jerseys, Ayrshires, Shorthorns, Holsteins; 3d trial, Jerseys, Ayrshires, Devons. In the second trial, the Ayrshires led on quantity of curd without fat, but with curd *and* fat took second place. With this exception, the Jerseys stood first in quantity of curd as well as fat. In regard to quantity of casein alone, in the milk of different breeds, the table previously referred to shows their relation with approximate accuracy, in the column headed "Protein."

The same table gives the differences in chemical composition and computed value, between average full-cream cheese, the same made from pure Jersey milk, half-skim cheese, and that made from skim-milk and from whey. There is very little light here as to the merits of different breeds of cattle as respects the quality of cheese made from their milk, although the surprising fact is shown that Jersey-made cheese is so much richer in both caseine (proteids) and fat, that it is worth a cent more a pound than the average full-cream cheese of

America, as an article of nutritious food. Upon this point, Professor Arnold says in his American Dairying: "The business of the Jersey cow is emphatically that of buttermaking. Her milk, however, is rich in cream matter, and contrary to the general belief is capable of making as fine cheese as it does butter. It is a new feature, worthy of note in the uses of this breed of cattle, that their milk can, without the waste of its buttery matter, be converted into a strictly fancy cheese, as rich as English Stilton. Analyses of cheese from pure Jersey milk, made at Cornell University, have shown over forty per cent. fat."

The table upon which we have been depending gives so little in regard to differences in cheese, that I append another, with considerably more data in this connection:

Table of Analyses of Different Kinds of Cheese.

DESCRIPTION OF CHEESE—100 POUNDS.	Water. lbs.	Fat. lbs.	Protein or curd. lbs.	Ash. lbs.
1. Average of 83 samples Full-cream Cheese,	35.75	30.43	27.16	4.13
2. Average of 21 do., N. Y. State Dairy Commissioner's Report,	27.82	28.61	38.10	4.39
3. Full-cream, premium at N. Y. State Fair. (Flint's Dairy Farming; of pure Jersey milk),	38.46	31.86	25.87	8.81
4. Full-cream, premium at N. Y. State Fair,	28.37	31.28	30.52	3.83
5. Full-cream, premium at N. Y. State Fair,	28.62	29.90	37.66	3.82
6. Full-cream, premium at N. Y. State Fair,	33.75	28.95	83.70	3.60
7. Full-cream, premium at N. Y. State Fair,	28.11	41.03	28.18	2.68
8. English average, by Sir Lyon Playfair,	38.78	25.30	31.02	4.90
9. English Chedder, two years old, Prof. Johnston,	36.04	30.40	28.98	4.58
10. English Double Gloucester, one year old, Prof. Johnston,	35.81	21.97	37.96	4.25
11. English North Wilts, one year old, Prof. Johnston,	36.34	28.09	31.12	4.41
12. Half-skim, average of 8 English samples,	46.82	20.54	27.62	3.05
13. Half-skim, N. Y. State,	38.25	19.93	38.48	3.24
14. Skim-milk, average of 9 English samples,	48.02	8.41	32.65	4.12
15. Skim-milk, English, one year old,	43.82	5.98	45.04	5.18
16. Whey Cheese, average 6 samples,	23.57	16.26	8.88	4.76

One product of the dairy only remains to be considered. This is butter—the culmination of the dairyman's art. This great delicacy consists of the natural fat of the milk, with some water, and should contain nothing else, except as we choose to flavor it with salt. The perfection of butter-making is to secure these fats, separated from the serum or fluid of the milk, and gathered in a mass, with as little chemical and physical change as possible. So it may be said that we *get* the butter from the milk, rather than "make" it. Unfortunately, perfection has not been reached in this art, and there is always present in butter, mingled with the fats and mainly dissolved in the water, more or less of the protein or curd and of the sugar of milk. It is these constituents which play the mischief with butter, by starting the chemical changes leading to rancidity and decomposition, and which we consequently endeavor to reduce to the minimum.

While, therefore, in nearly all other food products, the presence of protein (because of its high nutrient quality) adds to the value of the article—if we place butter at all in the list of foods, that which has the highest nutrient value is the poorest in those qualities which go to make fine butter. We buy butter for its fat, and the more fat and the less water and protein, the better it is, as butter. In our table comparing foods, there are averages given of butter of different kinds, and, for the reasons stated, the best butter is designated by the highest figures in the column of carbo-hydrates, and not in the "Value" column.

Examining butter in detail, it is found to be composed of very complex fats, the chemist naming eight or ten, which number he divides about equally into insoluble fatty acids and volatile fatty acids; also, in their combination with glycerine, into solid fats and fluid fats. It is not my purpose, however, to go into these details, but to call attention to the differences in butter, as it usually exists. Among the many writings upon the composition of butter none has seemed to me so ingenious and painstaking in method, or practical in conclusion, as the work of Dr. S. M. Babcock, chemist of the New York Agricultural Experiment Station at Geneva. At the annual fat stock and dairy shows in Chicago, in 1885 and 1886, and at the Bay State Agricultural Society's fair at Boston, in October, 1886, I was able to secure for this gentleman samples of the premium butters of known origin—the certificate of the maker, as to the method and breed of the cows giving the milk, accompanying every exhibit. Upon these Dr. Babcock pursued his investigations, and he personally obtained another set of samples of butter, with the history of each, at the New York Dairy and Cattle Show, May, 1887. Based upon his examinations of this last lot, Dr. Babcock prepared his report upon "Variations in the Composition of American Butters," which I have already mentioned, and to some parts of which I now wish to refer. The butters upon which he worked, and which gave the results presented in his tables (see Proceedings of Society for the Promotion of Agricultural Science, eighth meeting, New York city, August, 1887, page 17). were twenty-six in number, seven being from Jersey cows, seven from pure Holstein-Friesians, two from pure Guernseys, one from Ayrshire, and nine of premium butter from mixed milk, no special breed predominating.

These samples were examined to determine the variation liable to occur in the best grades of American butters, and especially to note how far these variations might be attributed to breed and to the individuality of the cow. (Some of the samples representing each breed were from the milk of a single registered cow.) The general determinations were noted as a matter of some interest, but attention was mainly devoted to the composition of the butter fats. The following are the average extreme figures for these prize butters, and probably fairly represent the average composition of first-class butter in this country:

	Water.	Fat.	Ash.	Curd.
Highest,	13.16	87.87	4.23	1.02
Average,	10.82	86.44	2.14	0.60
Lowest,	9.26	83.19	0.96	0.34

It may be noted that these butters averaged better than those in the food table, the average here being about equal to the Ayrshire butter in that table, and the poorest here being rather better than the poorest there. (It should also be stated that none of the milk and butter of these and other recent examinations by Dr. Babcock are included in the averages of the food tables previously noticed.)

The further examinations comprised determinations of the relative quantity of volatile fatty acids; of insoluble acids, by what is called the "Iodine Number;" of the melting point, and a test devised by Dr. Babcock of the viscosity of soap solutions made from butter. The technology of the chemical processes it is hardly desirable to describe here, but they are necessarily referred to by their peculiar names in the following abstract from Dr. Babcock's table and his deductions from it:

Comparisons of Butters from Different Breeds of Cows.

BREED.	Iodine number.	Melting point.	Viscosity number.
		Per cent.	
Jersey,	31.2	34.0	74
Guernsey,	31.5	33.3	110
Ayrshire,	37.8	33.5	66
Holstein,	40.0	33.4	237
All others,	35.6	33.8	93
Average of all,	35.6	33.7	127

The volatile fatty acids are not included in the table, because it was found that while the individual variations within all the breeds was very great, the influence of breed did not appear in this particular.

The insoluble fatty acids were found quite constant in amount, but very variable in composition. The "Iodine Number" indicates the relative proportion of oleic acid and the absolute quantity of this soft fat in the total fats of the butter. "The influence of breed upon this factor is very great; one of the most marked characteristics of Holstein butter, when compared with that of the Jersey or other breeds, being shown in its high per cent. of olien. This renders butter less firm in warm weather, although it does not materially lower the true melting point." (The quotations are from Dr. Babcock's article. He preferred to compare Holstein and Jersey butter because they showed the greatest contract, and also because, having several samples of each, equal in number, the averages were deemed more reliable than those of the other breeds of which he had only one or two samples.)

The melting point is expressed in degrees of the Centigrade thermometer, and the record illustrates the observed fact that it requires a higher degree of temperature to melt Jersey butter than the average.

From a test not shown by the above abstract from his table, Dr. Babcock determined "that the proportion of palmitic and other fatty acids of less molecular weight than oleic and stearic, is considerably greater in Jersey than in Holstein butter."

The viscosity test indicated breed peculiarities very clearly, as well, in the composition of butter from single cows not shown by other methods. This is a very clever method of testing, and especially applicable to the detection of adulterants in butter; it is fully explained in the Report of the New York Agricultural Experiment Station for 1886. In this instance the pure Holstein butters had an average viscosity of 237, ranging from 112 to 461; the pure Jersey butters averaged 74, and ranged from 50 to 103. The numbers are relative only, but representative of a marked contrast. Dr. Babcock says, "The other conclusions in regard to the differences which exist between Jersey and Holstein butters are confirmed by the viscosities of their soap solutions" (i. e., by his viscosity test).

Although these fine analytical tests may not be well understood by these brief technical references, it seemed proper to adhere closely to the conclusions of the original report, before stating the practical deductions. Now, as to the latter: "The influence of breed of the cow upon the composition of the butter fat is no less marked than it is upon the composition of the milk, and, contrary to general acceptation (this statement is based upon other investigations,) that does not appear to be materially affected by the character of the food." (Dr. Babcock.) Among the effects of breed thus noted, are those differences in butter which relate to its firmness, resistance to heat, texture or "grain" flavor and general high quality, by reason of a larger proportion of the more delicate fats. In all these particulars, butter from pure Jersey milk excels, while that from other breeds follows in the order given in the last table.

In conclusion, it is hoped that facts of a reliable character have been herein presented in sufficient number and with such reasonable distinctness as to show the great differences which occur in dairy products, milk, cheese and butter, the influence of breeds of cattle in causing these differences, and the consequent practical value of a study of this subject when selecting stock for the profitable conduct of any branch of dairying.

Mr. HOARD. I want to show wherein Prof. Babcock's investigations as to viscosity of milk can be made of very practical advantage to the intelligent buttermaker.

The excess of albumen, its thickness, its density. When it is viscous no living man can churn it. Put your finger into it and it will stick. Drop pieces of broken cracker into it and it will cement them almost like glue. We often say science is of no account; we practical men say, get out with your science, we want something we can make use of, we cannot have time to learn scientific names.

We have got to learn these names. We learned the meaning of telephone and telegraph, and we must learn the meaning of the word proteineum and of carbo-hydrates and of albumen. Albumen, that quality that makes the white of an egg what it is, and that quality that makes milk viscous.

I do not know why the cow at some portions of the year precipitates more than at others. I do know that when feed is most succulent and abundant that it is at its lowest stage, and as the cow runs toward winter it increases. I do know when the cow is fresh she has the lowest percentage of albumen or viscousness, and it runs higher as she approaches calving again. At this time the milk becomes more and more viscous, and it becomes harder and harder to churn. And at this time the milk loses its flavors, and the butter has less flavor and is tallowy. We must then depend upon fresh cows in the herd to keep up the flavor of the milk and butter. The globules become smaller.

My old mother and aunts knew a little practical thing that we have forgotten, that was to put some water in the milk. If you take that little matter, and as you come down towards the period of slow creaming and stubborn churning of milk, and put about 25 per cent. water you will succeed in churning much easier. It will make a wonderful change in the quickness of the churning. With the separator you only have to change the creaming gauge.

I know a man in Illinois that astonished everybody with his yield of milk in the fall of the year, and it was not known how he did it. He finally conveyed the fact to me. He said he added 25 per cent. of water. It took a little longer to run it through, but he increased the fluid of the milk and thereby helped himself.

A MEMBER. Is there any difficulty in raising cream by the actual process during the period of heavy milk?

Mr. HOARD. Yes, sir, there is difficulty in any process except the separator. The separator yanks it right out. I found out by an experiment that by adding 33 per cent. water I got a decided increase in cream.

A MEMBER. The value of Jersey butter is 11.41, and Holstein 11.28 —explain that.

Prof. ALVORD. In one hundred pounds of Holstein butter there are two and two-thirds pounds of cheese, and in one hundred pounds of Jersey butter there is less than one-half of this quantity. Holstein butter is worth more per hundred pounds because it is poorer butter. The food value of butter is just the inverse according to chemical composition, just exactly the opposite the quality of the butter. The more stuff there is in butter that is not butter, the higher the value according to this table.

A MEMBER. Do I understand you that Jersey butter has better keeping qualities than the Holstein?

Prof. ALVORD. Better keeping qualities because there is less troublesome materials in it. That, however, is largely a question of making. Those are ascertained facts of a great many different men.

Mr. STURDEVANT. I would like to ask the gentleman if he would concede a little in favor of the Holstein, and that is that they would not have to put in any water. I understand the gentleman is a Jersey man.

Prof. ALVORD. I have endeavored to stick to facts, and having found there was more water than the figures justified, I endeavored to reduce the water according to the figures. I have given figures obtained from undoubted sources. I simply gathered these facts from different sources, and presented them as they were presented here.

The point that Mr. Hoard raises as to the viscosity of cream and milk at the different periods of gestation of the animal applies to all breeds alike, and there would be the same reason for water in the Holstein milk as any other. The gentleman asks what the figures show as to the total of casein and fat in these three samples. In averaging cow's milk, all averages obtainable there would be not over ten pounds in every one hundred pounds of milk; there would be seven pounds fat and casein. In one hundred pounds of average Holstein milk, there would be rather less than 6½ pounds of fat and caseine, 6 $\frac{45}{100}$; in the average Jersey milk in one hundred pounds there would be fat and casein, 9 $\frac{4}{100}$ pounds.

Mr. SHIPPEN. Taking wheat at ninety cents a bushel, corn at sixty cents., and oats at forty cents, I would like to know whether there would be any difference in the butter producing food, if so, which would be the cheaper.

Mr. HOARD. That is a very difficult question to answer. I do not regard either of those grains mentioned as desirable cattle food, unless mixed with other products. If you are feeding timothy or ordinary meadow hay for a butter ration, I should leave out corn meal and corn, and certainly prefer wheat and oats, I should leave wheat out and use oats. For a butter ration I should add oats to timothy or mixed timothy hay, but if using clover hay, then the clover would contain the nitrogenous quality, and I would give some grain. But standing alone the grain would not do.

THE BUTTER TEMPERAMENT OF THE COW.

Mr. HOARD. In presenting this subject of the butter temperament of the cow I may be fairly accused of stating my own convictions, and nothing else. For thirty years I have been a student of the cow more particularly in a physiological way. A number of years ago, about fifteen years ago, I commenced a slow process of collecting some facts which lead along up on a line to the physiological differences there are in cows. There is an old saying, and a good one, that there is a difference in sinners. There are a great many sinners that you and I prefer to other sinners. A great many people so-called Christians we reject and prefer some sinners. There are differences in men and in their capacities, and those functional differences in men are very curious. Let me say here that it is peculiarly indicated in form. Two thousand years ago it was said that form is everything to purpose. This is true when we survey the cow from the standpoint of a machine, or when we survey man from the standpoint of being a machine, having certain peculiar functional conveniences for certain classes of work. When we do this we will begin to see how strange his form fits into the character of his work. For instance did you ever know a piano player in your life with a short, thick, fat, dumpy finger? Did you ever know a man with a short, thick, finger that could play the violin? I think not. There are exceptions to all rules, of course. But to this one I have known an exception. I have seen men with fingers of this kind attempt to play the violin, but I never saw one that could make a fine tone. I never saw one that could make a fine tone unless he had a long, strong, bony finger. Did you ever see a woman that was a deft, successful seamstress that had a short, thick finger? We may go down in this physical formation from one thing to another, and running alongside of this functional aptitude we will discover a rare coincidence in the nervous temperament. Some men are known as nervous, bilious temperaments, and they have a smooth oily skin. You will always notice these peculiar physiological facts obtain where men have a thin skin. Where they have that peculiar temperament it leads to certain formations. Did you ever think that men with certain temperaments naturally drift into certain vocations, and others into other vocations? If you never did, make it a study.

This nervous temperament lies underneath the functions of animals. Horses adapted to different things have different shapes and temperament goes with the shape. Nervous temperament produces certain formations, also produces certain results.

The intelligent breeder, not the perfunctory breeder, goes down to these fountains, and breeds from there, takes into consideration the differences of animals, and if he is breeding for butter, he builds upon this nervous temperament. He is careful not to introduce any cross temperaments that will make his cattle skittish.

You all know what kind of a garment shoddy cloth makes. When the breeder builds upon this nervous temperament line, he comes up to almost phenominal results. We see this in all kinds of animals in their shape.

As we breed towards the nervous temperament we swing away from the lymphatic, or flesh producing. The further we go towards the breed for butter, the further we go away from breeding for flesh, and also the more decided we change the whole shape of the animal. We build up from the temperaments and produce certain types of animals, just as we desire.

I claim the production of butter is largely the work of the nervous temperament. If we produce a butter cow we must breed towards the nervous temperament. I use the word nervous to indicate the temperament. We have misused many words in the English language, therefore, misunderstanding their meaning. We often speak of a man or woman as being nervous, when we ought to say nerveless, without nerve. A man of nerve is a man who has a steady, strong nerve and control of the muscles. When the nerves of a man break, everything else goes after it.

As we breed towards the nervous system we breed towards certain formations of the body, and certain, quick, positive actions of the body. I believe butter to be essentially the product of nervous energy. The production of butter is a maternal function, and a maternal function is essentially, more than any other function of the body, an employment of the nerves. Butter is not the product of fat fed to the cow. No cow ever made an ounce of butter from fat. She takes the carbo-hydrates and makes this fat. It contains a certain amount of albuminoids, proteneum or nerve-supporting food. Bran is of great use in the production of butter, for the reason that it is a nerve-supporting food. When butter is produced and taken into your system for digestion it is an anomalous food and does not injure your system as lard or beef suet would. When you eat those things you eat nothing but carbon, but when you eat butter you eat a food that does not injure the system. This is a most serious indictment of substitute butters. They are injurious and have a depressing effect.

Do not engage in the foolish notion of having a general-purpose cow. Take the idea of heredity. It is what men have done before us that makes us what we are. The man of to-day is the product of his mother.

For a good dairy cow I want in the first place a wide nostril; I want a large capacity for breath, wide mouth, prominent eye. A prominent eye indicates a very harmonious nervous system; it indicates a strong nervous system. I want to see a cow with a very strong muscular jaw. I do not like to see a cow with a very thin, lean jaw. Good development from the eye to the poll. The next most important thing is the jointure of the spine to the head. And there I commence the course of investigation. I want a cow to show a very strong back, a high, rugged, strong back. I do not care if the spine rises above the crops an inch. A long tail is an indication of a strong spine. A cow should show broad upon the hip, and there should be a good length from the hip joint. Mary Ann Lambert measures twenty-two inches across the hip. The line of absorption should be from the highest point at the top to the furtherest point down. The length of that line is an indication of the amount of absorption of the udder over the general system of the cow. A long line indicates strong action over the whole system of the cow; a strong udder should be narrow. The character of the udder should be velvety. One of the best indications is the formation of the navel. A cow must be able to take a large amount of food, and produce her products with it. A cow must have a strong development of the umbilical portion of the abdomen, and the muscles coming up towards it. It is an indication of the cow's strong constitution. The other indications may be lacking, but she will have a strong constitution.

I have tried the experiment of raking a pin across the flank of a cow. She moaned while I was milking her, and her milk showed a loss of fifteen per cent. in cream. Just that little disturbance cut a half out of her milk, almost instantly. This and other experiments show how closely are allied the nerves of the butter temperament. The mammery gland is united with the uterus. Any disturbance to one is felt by both.

If you want a cow that will perform the greatest amount of work and give you the greatest amount of profit you must secure one which has departed from the lymphatic temperament. If you breed for other purposes you must breed away from the dairy qualities of the cow.

AFTERNOON SESSION.

Report of the Auditing Committee.
Report of the Special Committee on Resolutions.
On motion, referred to the Executive Committee.
Election of Officers.

THE QUESTION BOX.

Question—We have been told how to produce butter, but not how to sell it. Will some one tell us how to sell it?

Mr. **Hoard**. I can tell you how I sell my buttter, but not how to sell somebody else's butter. We make a mistake forcing our butter into big markets. In the first place a man should himself go to the market. He should throw himself right onto the market. I got our people to ship their butter on commission some two or three years ago, and to-day there is not one that will ship butter all over the United States. There is a demand for their butter at home.

Mr. **Shippen**. I would like to ask if there is any way of keeping June butter until January.

Mr. **Hoard**. There is a way, but the end thereof is death. It is my candid opinion that butter is never worth so much as when it is first made. If you make your butter and ship it as fast as it is made you will be better off. We make fine butter for the standard market. If that is done the butter will be sweet, not subject to loss, and you can hold the flavor.

Question—Is dehorning cattle practiced in Wisconsin, and with what success?

Mr. **Hoard**. It is practiced more than I wish it was. I am opposed to dehorning. I will confess there are occasions that it can be made use of with economy. Dehorning dairy cattle I believe to be injurious to the nervous temperament.

Mr. J. C. Sibley, of Franklin, here offered a resolution of thanks to Hon. William L. Scott, for his efforts in the interest of the oleomargarine law. This resolution was unanimously adopted.

The following communication was received from the Pennsylvania Agricultural Society, and was laid on the table:

Harrisburg, *January 18, 1888.*

At a meeting of the Pennsylvania State Agricultural Society, held in Harrisburg, January 18, 1888, the following preamble and resolution was offered by David H. Branson, of Chester county, and was unanimously adopted. For the purpose of harmonizing and furthering the cause of agriculture in all its various departments, it is proposed that the Pennsylvania State Agricultural Society, the Fruit Growers', Dairymans' Association, and all kindred organizations for the promotion of agriculture, conduct a State Convention, or Farmers' Institute, under the auspices of the Pennsylvania State Board of Agriculture; and, it is therefore,

Resolved, That the Pennsylvania State Agricultural Society appoint a committee to confer with the secretary of the Pennsylvania State Board of Agriculture, and also the several organizations named, with a view to making all of the preliminary arrangements, fixing dates, and place of meeting.

The following committee was appointed by the president: David H. Branson, Atglen, Chester county; George Blight, Philadelphia; John McDowell, Washington, Pa.

REPORT OF COMMITTEE ON VIOLATION OF OLEOMARGARINE LAW.

First, That the Legislature be requested to create the office of Dairy and Food Commissioner, whose business shall be to see that all laws relating to the adulteration of dairy and food products be inforced.

Second, That until the creation of such office and the appointment of such commissioner, the secretary of this association be directed to request the judges of the different counties of this Commonwealth to see that its laws are enforced in this direction.

Also, to correspond with the district attorney's of the different counties, in which the law is violated, to have them send to the secretary of this association the name of some intelligent constable in the city or town where such violations are committed; and that the secretary request said constable to do as this association may direct, and we would recommend the appropriation of a sufficient sum of money to pay said officer his lawful expenses, should he fail to recover at court.

J. S. LAVERY,
J. C. SIBLEY,
W. W. DEAN.

This resolution was laid over for future action.

COLOR.

By D. W. ELDERKIN, *Crawford County.*

Many years ago, before the question of the color of animals was much agitated, I came to the conclusion, from observation, that white, the absence of all colors, indicates degeneracy in the animal kingdom. White cattle are not so hardy and enduring as those of color. Snow white dogs and cats are subject to weak eyes and move with a sluggish, tired motion. The ranks of white chickens seem to thin out more rapidly than black ones and the old hens show age sooner than those of color. Are they a feebler class of beings, than those of color, is the question. The power and vital force of all animals depends upon their brain battery and volume of electricity, coupled with a proportionate anatomy and muscular structure, upon which, and through which the electric agent can work. The greater the electric power the greater the work that can be accomplished. Who does not know that the black cat's hair rubbed up in a dark room will emit twice as much electricity as a white one? And who does not know that as a rule the males of the feathered tribe are stronger, and consequently positively electrified, compared to the females? Then how is it with their colors? Look at the peacock, the turkey, crow, blackbird, humming-bird, or any other bird, and observe the beauty of the male compared to his mate. Why are these beautiful variegated colors adorning one and withheld from the other? Simply because the electric forces of the involuntary brain are so much more prolific than the formative elements of fiber can be selected from nature and assimilated into the structure of the feathers in such waves and textures as to reflect the most beautiful colors of the rainbow. The number of colors and combinations of colors reflected depends upon the number and combination of materials used in making the feathers. We do not get a reflection of two or three colors from one simple element of dye. The more ornamental feathers we find on a fowl, the more elaborate the work has been and the more vitality or electric force has been consumed; and it must not have been consumed to the detriment of the other functions of the body. The capital must be on hand, in store for use. There is no credit in this kind of building and ornamenting. It is very easy to observe the result of the electric forces of the cerebral brain; as when a cock flies upon a fence, flaps his wings and crows, we see an external voluntary demonstration of power and will. But it is not so easy to note the functions of the cerebellum, the involuntary brain. This brain has as much intelligence in performing its internal and hidden work, as the reasoning brain has in taking care of the external wants of the body. If a limb is broken or a lesion produced by any cause, it is the work of the involuntary brain to take charge of the injury and conduct the processes of cure. This is done by sending an unusual quantity of electricity to the injured locality to create an inflammation, indicated by redness, swelling and heat. The redness is caused by congestion of blood, the swelling is produced for the purpose of forcing the formative elements of tissue, in the blood, through the walls of the capillaries, where it is built into the lesion as a mason repairs a broken wall. The heat is produced by the action and friction of the work being done. This is only one of the wonderful functions of the cerebellum. It has charge of deglutition, digestion, assimilation, and excretion. It causes the heart to beat, the lungs to breathe, and regulates all the secreting and excreting glands of the body. The process of metamorphosis is wonderful in its minuteness, continuity and amount of work. All this vast amount of intricate work is carried on by the involuntary brain, through its agent, electricity. If this brain becomes weak or the quantity of electricity small, the work is poorly done and general debility is the result. In-breeding has a tendency to produce weakness, and if carried to a great extent, will show a marked debility of both mind and body. Now suppose the cerebellum of such a hen has all it can do to carry on the vital functions of the body, would it be strange if the ornamental part was neglected? In the operations of the voluntary brain, we find lack of resources followed by a cutting down of expenditures. Why is this not as natural a result with the other mind that cares for internal wants and supplies. If the egg does not contain the material for absorbing some colors and reflecting others we cannot have a colored chicken, unless the chicken possesses an omnipotent power that can make something out of nothing. In case of black fowls the dye element absorbs all the colors and conveys to the mind of the beholder, darkness or black. This absence of all color is often shaded with green, the reflecting substance,with which, nature seems most liberally endowed. The element that reflects a certain color is not necessarily the same color as that reflected; but must possess the properties to absorb all the other colors. That objectwhich appears white, reflects all the colors of the sun's rays, unseparated, in their entirety. The debility of age changes the young man's raven locks to white; debility by sickness or age of a negro causes his skin to fade. Why is this change in the young man's hair and beard? We will ask that intelligent philosopher in the base brain who has charge of the entire laboratory of life. He says: in the debility of old age my resources diminish and my electric agent becomes weak, so I must use my resources and power for those purposes which are essential to life. The metamorphosis of the brain, heart, stomach, liver, pancreas, lacteals, blood, and kidneys must be attended to. The hair, teeth, and nails can be neglected; and most of all the dye in the hair which first admonishes us of the approach of age. So we see from this investigation that it not only requires vigorous vital forces to place color in a bird's feathers, but a continuation of that power to keep it there. If this course of reasoning is correct, why may not a degenerated race of cattle, dogs, cats or hens, turn white?

Electricity is the life agent. A white animal reflects all the colors of the sun's rays and its electricity with it. A black one absorbs both light and electricity.

ELECTION OF OFFICERS.

The association then proceeded to the election of officers, with the following result:

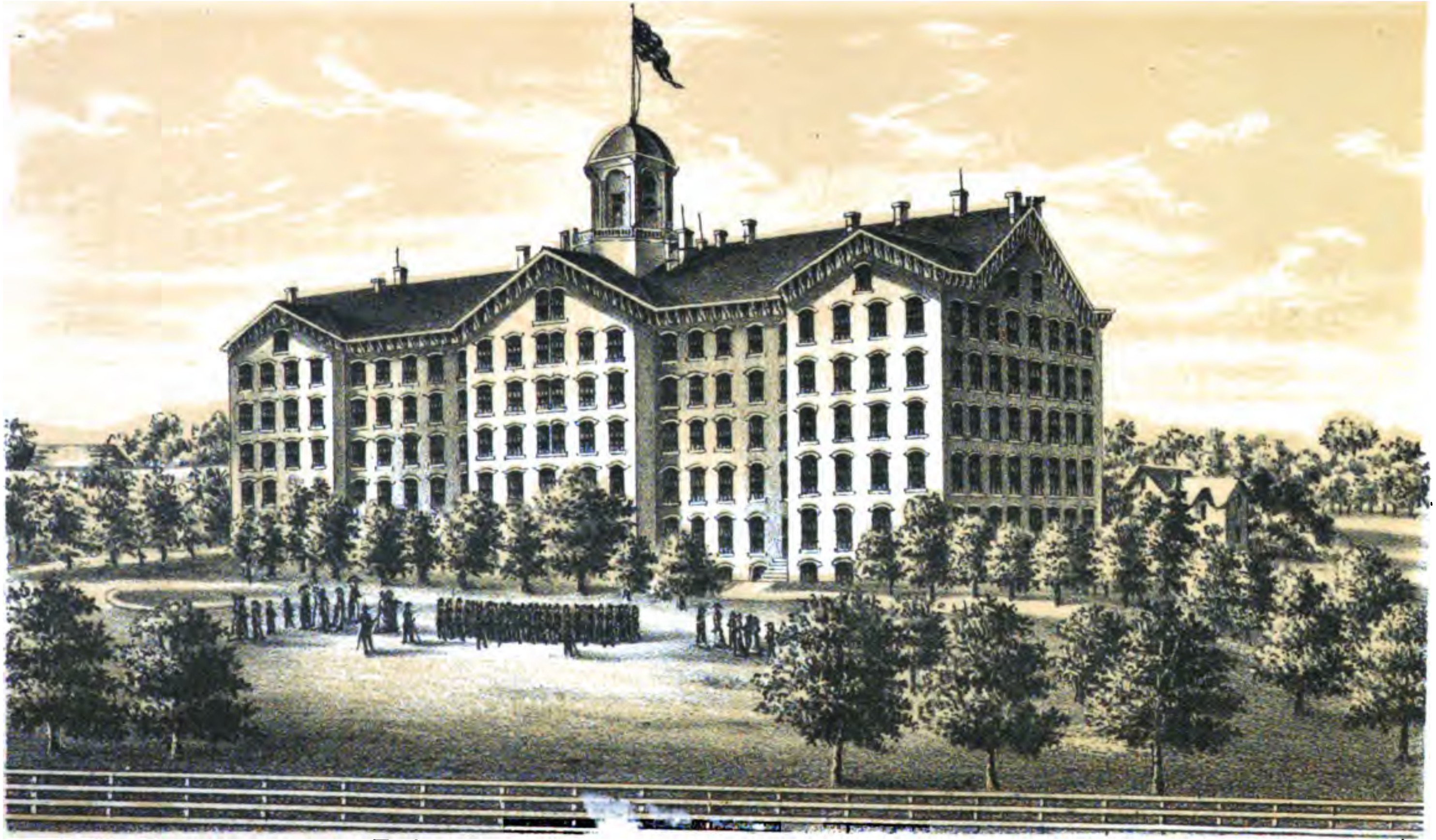
President—J. C. Sibley, Franklin.

Executive Committee. First Vice President—J. B. Phelps, Conneautville; *Second Vice President*—W. B. Denny, Meadville; *Third Vice President*—A. M. Fuller, Meadville.

Secretary—G. H. St. John, Meadville.

Treasurer—W. W. Dean, Meadville.

Adjourned to meet at the call of President.



THE PENNSYLVANIA STATE COLLEGE.

Official Document, No. 2.

ANNUAL REPORT

OF THE

Pennsylvania State College.

BOARD OF TRUSTEES.

Members Ex-Officio.

His Excellency, James A. Beaver, Governor of Pennsylvania.
Hon. Charles W. Stone, Secretary of the Commonwealth.
George W. Atherton, LL. D., President of the College.
Hon. Thomas J. Stewart, Secretary of Internal Affairs.
Gen. Daniel H. Hastings, Adjutant General.
E. E. Higbee, D. D., Superintendent of Public Instruction.
John McDowell, Esq., President of the State Agricultural Society.
Joseph M. Wilson, Esq., President of Franklin Institute.

Elected Members.

Hon. George W. Hood, Indiana.
ndrew Carnegie, Esq., Pittsburgh.
V. White, Esq., Bloomsburg.
Joel A. Herr, Esq., Cedar Springs.
Cyrus Gordon, Esq., Clearfield.
Hon. John H. Orvis, Bellefonte.
Hon. Amos H. Mylin, Lancaster.
Hon. John A. Woodward, Howard.
Sam'l R. Downing, Esq., West Chester.
John Hamilton, Esq., Lemont.
Capt. Chas. W. Roberts, West Chester.
Hon. Francis Jordan, Harrisburg.
Gabriel Hiester, Esq., Harrisburg.
James B. Doyle, Esq., Philadelphia.
Frank Knoche, Esq., Harrisburg.

FACULTY AND INSTRUCTORS.

George W. Atherton, LL. D., President: Political and Social Science.
James Y. McKee, M. A., Vice President: English Literature and Mental and Moral Science.
William A. Buckhout, M. S., Botany and Horticulture: Secretary.
Charles F. Reeves, M. S., Modern Languages: Librarian.
I. Thornton Osmond, M. S., M. A., Physics.
Josiah Jackson, M. A., Mathematics.
Louis H. Barnard, C. E., Civil Engineering.
John W. Heston, M. A., Principal of Preparatory Department.
Harriet A. McElwain, M. A., Lady Principal: Latin History.
Louis E. Reber, M. S., Mechanics and Mechanical Engineering.
William Frear, Ph. D., Agricultural Chemistry.
Samuel S. Pague, First Lieutenant, 15th Inf. U. S. A., Military Science ana Tactics.
Gilbert G. Pond, M. A., Chemistry.
Milton W. Bohn, B. A., Assistant in Preparatory Department.
William H. Caldwell, B. S., Instructor in Agriculture.
Nelson E. Cleaver, A. B., Assistant in Preparatory Department.
Fred. W. Spanutius, Ph. B., Assistant in Chemical Laboratory.
Josephine Hoggs, Instructor in Music.

DESCRIPTION OF THE INSTITUTION.

THE PENNSYLVANIA STATE COLLEGE

Was organized in 1859 as the "Farmers' High School," and its object then was to give an exclusively agricultural education. Its organization, however, was upon a collegiate basis from the beginning; and its name was, in 1862, changed to "The Agricultural College of Pennsylvania." Subsequently, the Legislature of the State having appropriated to this institution the income from the proceeds of the National land-grant, and the scope of its work having thus been necessarily enlarged, its name was, in 1874, again changed, and it has since been known as "The Pennsylvania State College," a name which indicates the intimate connection of the College with the State Government, and its relation to the people of the whole Commonwealth.

The scope of the institution, as now organized, cannot be better stated than in the following comprehensive words of the act of Congress:

"The leading object shall be, without excluding other Scientific and Classical Studies, and including Military Tactics, to teach such branches of learning as are related to Agriculture and the Mechanic Arts, in such manner as the Legislature of the State may prescribe, *in order to promote the liberal and practical education* of the Industrial Classes *in the several pursuits and professions in life.*"

This act of Congress was, in 1863, "accepted by the State of Pennsylvania, *with all its provisions and conditions*, and the faith of the State * * * * pledged to carry the same into effect."—*Laws of 1863, p. 214.*

Based upon this broadened foundation, the special work of the State College is INDUSTRIAL EDUCATION; that is, the training of youth in those branches of learning which lie at the foundation of modern industrial pursuits. In accordance with the purposes of its founders and the terms of its original charter, it aims to give special and prominent attention to Agriculture, both theoretical and experimental. But it also provides a "liberal and practical education" in the leading branches of mathematical, natural and physical Science, in order to prepare youth for "the several pursuits and professions in life," as the laws of Congress and of this State distinctly require. While the College, therefore, is no longer exclusively agricultural, it is doing more in the direction of progressive and scientific Agriculture than when that was its principal object; and, at the same time, it has greatly increased its subjects and courses of study, and its teaching and illustrative equipment in other directions. "Without excluding classical studies" entirely, it aims to teach the various sciences in such a manner as to show their applications in the more important industries, and thus to combine theory with practice. Such a course of training, aiming to cover even a part of the vast field of modern scientific knowledge, must necessarily be somewhat prolonged. But its results are showing themselves, in a most gratifying way, by the readiness with which our graduates find honorable and remunerative employment.

The range of work is shown, as far as the limits of space properly allow, in the following schedules and descriptive statements. It is confidently believed that few, if any, institutions in the country furnish opportunity for obtaining an advanced scientific education, of equal extent and thoroughness, at so moderate a cost, and with so many incidental advantages.

LOCATION.—The institution is situated in the village of State College, Centre county, nearly twelve miles south-west of Bellefonte, and about equi-distant from the extreme parts of the State. Its position in the midst of a broad, rolling valley, with Muncy mountain on the north, Tussey mountain on the south, and Nittany on the east, secures a varied and remarkably beautiful landscape and a healthful climate.

A special act forbids the sale of intoxicating drinks within two miles of the College, and all its surroundings are exceptionally free from demoralizing influences and from temptations to extravagance.

The main college building is a plain and substantial structure of magnesian limestone, two hundred and forty feet in length, eighty feet in average breadth, and five stories in height. exclusive of attic and basement. It contains the public rooms—such as chapel, library, armory, cabinets, laboratories, society halls and class rooms—and a large number of dormitories. The building is heated with steam, one or more upright radiators being placed in every room, hall and passage-way; is furnished on every story with an inexhaustible supply of pure water from an artesian well, and is lighted throughout with electricity. The sewerage system is frequently and carefully inspected, and the unusual exemption of our students from every form of sickness justifies the statement that the sanitary condition of the building is very nearly perfect.

CAMPUS AND FARM.—The tract of land on which the building stands contains nearly three hundred acres. Of this, about fifty acres in the immediate vicinity of the building constitute the campus, and furnish recreation grounds, sites for professors' houses, and other needful buildings, etc., the whole being tastefully laid out and adorned with trees, shrubbery, flower gardens and walks.

PRACTICAL TRAINING.—The college has, from the first, sought to combine practical with theoretical instruction, and thus to fix in the student's mind a knowledge of both methods and principles. With this end in view, a portion of each student's time has been set apart for this training, and the number of subjects in which such instruction is given, and the apparatus for it, have been increased until it covers an extensive range of topics, as will appear from an examination of the several schedules. A portion of this training is largely technical, and so is almost wholly connected with these courses. Other parts, however, are so general in their character as to be appropriately required of all students. Among these, the following may be mentioned for illustration: *Book-keeping*, so important for the right conduct of all business; *Drawing*, free hand and mechanical, needed by individuals in all employments and professions; *Military Drill*, required by the law of Congress, and helpful in securing right habits of body and mind; *Mechanic Arts*, in which are learned, among other things, the making of plane surfaces, correct angles and joints, and the care and use of tools; *Horticulture*, where instruction is given in all ordinary operations belonging to fruit-culture, such as pruning, grafting, budding, and propagating by cuttings and layers; and *Surveying*, which acquaints the student with the instruments of the art, and trains him to determine points, distances and areas. Some of these practicums not only give knowledge of almost universal use, but also serve a good purpose by developing, during the early part of the course, tastes and aptitudes which may determine the student's choice of a technical course and of his life-work.

In the technical Courses, special lines of practice have a large amount of time given them, proportionate to their importance or looking to subsequent professional use. Each practicum is directed by an instructor who is familiar with both the theory and the practice, and their mutual relations. The instruction is so largely personal that an earnest student may advance far beyond the average attainments required as a minimum. The experience of the College adds, from year to year, to the evidence that this training is highly valuable, and in directions which no one can foresee, even when the pupil does not, at the time, fully appreciate its importance.

COURSES OF INSTRUCTION.

The organization of the College is such that the instruction given naturally falls under several departments, which are distinct, and yet so mutually related as to form, when combined in groups, well-proportioned, systematic, and progressive Courses of Study. The number of such courses is now nine, viz: A General Science Course, a Latin-Scientific Course, a General Course in Agriculture, and six Technical Courses, designated as Courses in Agriculture, Chemistry, Electrotechnics, Civil Engineering, Mechanical Engineering, and Natural History, respectively. There are, also, four shorter Special Courses. In the courses in Electrotechnics and Civil and Mechanical Engineering, the studies of the first two years are very nearly the same as in the General Science Course, being slightly varied with reference to the later stages of the work, and the strictly technical studies falling mainly in the Junior and Senior years. In the other three Technical Courses the studies *are the same for the first two years* as those in the General Science or the Latin-Scientific Course, at the option of students.

All students, accordingly, who intend taking a regular course (other than in Civil or Mechanical Engineering) enter the General Science Course, or the Latin-Scientific, at the beginning of the Freshman year, continue its studies until the end of the Sophomore year, and then either complete that course or select the Technical Course which prepares directly for their chosen work. The studies of the first two years are so arranged as to form a course by themselves, especially adapted to meet the wants of those who cannot take a full college course, but who desire to fit themselves well as land surveyors, or for any of the ordinary callings of life, at the same time acquiring a fair degree of liberal education.

Students leaving at this period of their course receive from the Faculty a certificate of their attainments.

The character of the several courses may be briefly indicated as follows:

1. The General Science Course.

The course in General Science may be taken as representing the general educational work of the college. It is designed to meet the wants of those who desire to obtain a sound and liberal education through the study of the mathematical, physical, and natural Sciences, and Modern Languages and Literatures, rather than the Ancient Classics. It provides a thorough training in Mathematics and Physics, (with the option of the Calculus in the Junior year.) a sufficient acquaintance with the leading branches of Natural Science. (as Chemistry, Botany, Geology, etc.,) and as much study of Mental, Moral and Political Science as is found in the usual college course, while the literary studies include an extensive reading of French, German, and English Literatures and literary history. No student can fairly complete this course without having acquired a stock of recent knowledge and a degree of intellectual training which will fit him to enter successfully upon any chosen career, and furnish an admirable and effective equipment for the duties of American life and citizenship.

2. The Latin-Scientific Course.

This course is nearly the same as the General Science Course, with the substitution of Latin for the first five terms in place of other studies. The course is shown in full in the schedule of studies. The instruction in Latin is wholly optional, and while it is not so extensive as in institutions in which classical studies are allowed to take the leading place, it is given with equal thoroughness and breadth, and is sufficient, both as an instrument of mental training and as an acquisition of learning, for all the needs of ordinary college students.

3. Courses in Agriculture.

In this subject three courses are provided—a General Course, an Advanced Course and a short Special Course. The object of the General Course is to meet the wants of students who wish to begin the study of Agriculture immediately after leaving the public schools, and for admission to this only a knowledge of the common English branches is required. The object of the Advanced Course is to give to young men a more thorough *education* at the same time that they are carefully instructed in the relations that the sciences bear to the various branches of Agriculture; to give both the mental training that is indispensable to success and the scientific and techical knowledge requisite for becoming efficient workers in agricultural directions, whether as farmers, teachers or investigators. Any lower aim would fail to meet not only the requirements of the laws under which the College is organized, but the progressive demands of the time.

To this end the State College offers to the student of Agriculture something more than the meager advantages of a manual labor school, on the ground that otherwise the desired objects could not be reached, and that it is both useless and unjustifiable for a young man to incur the expense of a college course in order to acquire the manual dexterity that could be secured with little cost elsewhere, and which every farmer's son obtains early in life. The aim in the courses in Agriculture is to teach how the principal branches of physical and natural science are applied to the business of farming, and to afford a thorough and comprehensive knowledge of its principles and methods. They explain the nature of soils and manures, the reasons for and the best methods of tillage, the constituents and characteristics of plants and animals and the conditions favorable to their development. They combine practice with theory wherever the processes involve skilled labor, but do not consume the student's time in the mere manual process of plowing, planting and feeding.

As will be seen by an examination of the schedule of studies and practicums of this course, the time is fully occupied with instruction in the class rooms, laboratories, orchard, vineyard and field, and no pains will be spared to give the earnest student a high degree of intellectual training, and a thorough, special preparation of the most advanced requirements of the farmer's calling. There seem to be comparatively few who desire to avail themselves of the advantages offered by the agricultural departments of industrial colleges. It is suggested, however, to those who are ambitious alike of usefulness and distinction, that the field of study and research in the interest of agriculture offers many great and inviting rewards to the diligent investigator.

The studies of the first two years include Mathematics, Surveying, the general principles of the Sciences, the Modern Languages and Rhetoric, with Latin for those who desire it. The direct application of science to agriculture and the consideration of purely technical subjects are reserved for the last two years, after the student has gained a sufficient basis of general knowledge. Instruction is given in connection with text books whenever suitable ones are available, but in some cases the subjects are of necessity presented by lectures.

The subjects taught after the beginning of the Junior year are so arranged that each is in some degree preparatory to those that succeed, and are grouped under general topics as follows:

Agricultural Chemistry.—The chemistry of soils, of vegetable and animal life, and of processes having relation to agriculture.

Agricultural Engineering.—Including drainage, the building and repairing of roads, foundations, preservation of structures of wood, etc.

Fertilizers.—The sources, composition and manufacture of commercial and farm manures, and their use in the production of crops; soil exhaustion; maintenance of fertility, etc.

Crops—Implements and special methods related to each farm crop.

Stock Breeding.—The history and characteristics of the various breeds of cattle, and the laws and methods involved in successful breeding.

Cattle Feeding.—The composition of the various cattle foods and of the animal body; the chemistry and physiology of digestion and the laws of nutrition; the kinds, sources and preparation of cattle foods, and methods of feeding for different purposes.

Veterinary Science.—The hygiene of the farm; causes and remedies of the more common diseases of domestic animals.

Farm Economy.—A comparison of the various systems of husbandry, with suggestions as to the business management of the farm.

Dairy Farming—The physical and chemical properties of milk, and the best methods of manipulating it in the manufacture of butter and cheese; the breeds of cows best suited for dairy purposes; care and management of cows, etc.

Sheep Husbandry.—The origin and characteristics of the different breeds of sheep; the adaptability of each to the various conditions of climate, etc.; and the best methods of management for wool-growing and the production of meat.

History of Agriculture.—The relations of agriculture, past and present, to social and political conditions, and to education, literature and science.

The character of the short Special course (of two years) is sufficiently indicated by its title. It is devoted almost exclusively to direct instruction in agricultural subjects, and is designed for those who wish to pursue them for a limited time only.

Information as to instruction in other subjects belonging to the Agricultural Courses is given under the departments of Botany and Horticulture, Zoology and Geology, etc.

PRACTICUMS.—It is intended that the management of the College farms shall be such as is sanctioned by the teachings of science and practice. Of this management in its various details the students of the courses in agriculture are to be observers, taking part in actual labor to the extent that is necessary for proper observation. The object of the practicums will in all cases be to secure from the student a report of the operations coming under his notice, with a discussion of the principles and a criticism of the methods involved.

The facilities for becoming familiar with the growing of the ordinary farm crops, the use of commercial fertilizers, the manufacture and use of farm manures and the feeding of animals for the production of meat and milk are now entirely adequate for ordinary instruction.

4. Course in Chemistry; and, 5. Course in Electrotechnics.

The instruction in these courses is designed for those who wish to become practical or professional chemists or physicists, as teachers and investigators, metallurgists or manufacturers in chemical industries, or for those who wish to pursue medicine, pharmacy, mining and similar professional or industrial occupations.

The extensive and well equipped laboratories afford ample opportunities for qualitative and quantitative work in both chemistry and physics. They enable the student of physics to verify the action and laws of physical force, the assayist to determine the value of ores, and the agriculturist to ascertain the composition of his organic products. Probably no two subjects of scientific study are intimately connected with so wide a range of modern industries as those which make up this course. During several terms past more than usual attention has been given in the department of Physics to the recent important development of electrical science and its extensive practical applications, and a full four years' course in Electrotechnics is now established.

5. Courses in Civil and Mechanical Engineering.

The object of these courses is to give thorough instruction in the studies and practical work pertaining to the two professions. The same studies to a considerable extent are necessary to the architect also, and to the mining engineer, and are valuable to any who desire proficiency in the applications of mathematics or physics. The work of the courses is so arranged that students may become thoroughly familiar with the theory and practice of field operations, the use and care of instruments and the work of the drawing-room, and through systematic training may establish a sound basis for future usefulness and success in the higher branches of the profession or any of its specialties. The harmony between theory and practice and their mutual dependence is dwelt upon in order to develop the power to think as well as the ability to execute. To this end experimental as well as rational methods are habitually introduced—as, for instance, while studying the principles from which the resistance of materials is deduced, the student verifies them by experiment in the workshop; and in like manner at every stage of the work the applications of principles are taught as second in importance only to a thorough knowledge of the principles themselves.

6. Mechanic Arts.

Combining shop-work and study.

This course was begun about five years ago, but has lately been reorganized and greatly extended, and went into full operation in September, 1884. It is designed to afford such students as have had the ordinary common-school education an opportunity to continue the elementary scientific and literary studies, together with mechanical and free-hand drawing, while receiving theoretical and practical instruction in the various mechanical arts.

The instruction in shop-work is given by means of exercises so planned as to cover, in a systematic manner, the operations in use in the various trades. The object of the course being to give instruction in the use of tools, only such constructions are made as cover principles without undue repetition. The first instruction in carpentering and joining is in the use of the saw and plane in working wood to given dimensions, and a series of elementary exercises follow in order; such as practice in making square joints, different kinds of dovetails, the various tenons, roof-trusses, panels, etc. The instruction in turning and circular section pattern-making is given from a series of models; also bench patterns are made for subsequent use in the foundry.

The foundry course consists in casting from the patterns which the student himself has previously made. Many of the pieces cast from these patterns are used in his clipping and filing work.

In the forge shop are taught the management of the fire and the degree of heat necessary to forge the different metals. Drawing, forming, bending, upsetting, fagoting, splitting, punching, chamfering, annealing, tempering, case-hardening, etc, are taught by means of a series of exercises in which the elements of the iron-forger's art are particularly dwelt upon. Every piece is made to certain dimensions laid down upon the drawing, the article being forged before the class by the instructor, who directs attention to the essential features of the operation, which is then repeated by each student. The course in vise-work includes filing to line, filing to template, free hand filing, fitting and chipping straight and grooved surfaces in cast-iron, wrought-iron and steel. In the machine shop the student, after having the lathe and its mechanical construction explained to him, is taught centering, tape-turning, chucking, reaming, inside and outside screw cutting, bolt-turning, etc. He is then required to coustruct some piece of mechanism in which many of these principles are involved.

Some may think that the variety of operations in the mechanic arts is so great as to make it impossible to give the student any real knowledge in the time at his disposal. It should be borne in mind, however, that this multiplicity of processes may be reduced to a small number of manual operations, and the numerous tools employed are only modifications of, or convenient substitutes for, a few tools which are in general use. The uses of the lathe are, to a great extent the same, whether the material is bone, metal or wood; whether the moving power is derived from the workman's foot, from a water-wheel or from a steam engine. Again, as fitting depends on a correct eye and manual skill, he who has learned to fit in metal by means of the clipping-hammer and the file, will not long find difficulty in fitting wood by means of the saw, the plane and the chisel. Mastery over a few processes and a few tools of universal application, acquaintance with the methods of fitting and finishing, and with the ordinary means of transmitting and converting power, are then the essential points embraced in this course.

The drawing of the course extends through the entire three years. This work is looked upon as of the highest importance, and the effort is to make the instruction thorough, practical and of direct utility. Considerable time is devoted to free-hand drawing, as it is believed that it not only assists in mechanical drawing, but is of great service in after years, whatever the occupation.

The mechanical drawing consists of a series of exercises, and such are selected as will be of subsequent use. They are arranged in progressive order, beginning with geometrical constructions involving straight lines and circular arcs only, and ending with the more complex curves, such as the ellipse, helix, epicycloid, etc. Projection is next taken up. The instruction in this is from models, so that the student may have before him the actual object from which the projection is made, and not be obliged to depend upon his unaided conception. After completing this work, he is required to draw parts of machines from actual measurements. For this purpose he is given some piece of mechanism to sketch and measure, and of which, finally, he is to make complete working-drawings.

In mathematics, the instruction covers algebra, plane and solid geometery, plane and spherical trigonometery, land surveying and mechanics, taught with special reference to this class of students, many practical applications being made. Candidates for this course must be at least fourteen years of age. and pass a satisfactory examination in the following subjects: Robinson's Complete Arithmetic (or its equivalent) to ratio, English Grammar (Syntax and Etymology), Geography and Spelling.

7. Ladies' Course in Literature and Science.

Young women are admitted to all classes in all Courses, on the same terms as young men, but a separate course is also provided containing more of the branches of study that are thought likely to be especially serviceable to them, with less extended requirements in Mathematical and Scientific studies. Parents who send their daughters to the College may rely upon their being surrounded by kindly and healthful influences, under the direction of a competent lady principal.

Young ladies not residing at their own homes occupy rooms in the portion of the main College building set apart for their use, either taking their meals with the boarding club or combining in groups to board themselves, facilities for that purpose (and some slight aid) being provided by the College. Table board can be obtained for them, when desired, in excellent private families.

The course in detail is shown in the catalogue, which will be sent on application.

8. Partial Courses.

Students of mature years, and younger students whose parents or guardians request it, are permitted to choose (among college studies) such special course as they may need. Such students must be prepared to enter upon and pursue with profit the studies chosen. They are required to have the same number of hours of class-work as other students, and to take part in the practicums to which they are assigned. Subject to these requirements, and to the ordinary discipline of the College, any person is at liberty to select from the entire range of studies such branches as he may wish to pursue, and for such length of time as he may find convenient, the purpose of this arrangement being to bring the advantages of the institution as fully as possible within the reach of every young man and woman in the State. Students are earnestly advised to enter one of the regular courses, and pursue it systematically to the end; but, in cases where that is not feasible, it is intended to make the State College, to the full extent of its resources, a place where any person may obtain that kind and degree of education which is most directly suited to his circumstances and purposes in life.

To those who satisfactorily complete one year or more of such special work, certificates under the seal of the institution are given, setting forth the studies which they have pursued, and their proficiency therein. The provision for partial courses does not extend to the preparatory classes, all studies in them being required.

AGRICULTURAL EXPERIMENT STATION.

The Agricultural department of the College has for several years carried on extensive lines of research and experiment, proper to what is now generally known as an Experiment Station. In accordance with the terms of the recent law of Congress, providing for the establishment of such stations in connection with the colleges founded on the Act of July 2, 1862, the Trustees of the State College have organized the Agricultural department under the title of "The State College Experiment Station," and the work will be increased to the full extent of their available resources. The object of the Station will be to pursue systematic and continuous investigations, but without losing sight of the practical needs of every day farming. It will endeavor to give assistance to farmers, in solving the problems that perplex and embarrass them, and it earnestly desires their coöperation through full and free correspondence. Bulletins of information will be issued from time to time, as they have been for the last five years, and will be sent free of charge, to all applicants in the State.

All communcations to this department should be addressed " Agricultural Experiment Station, State College, Pa.".

GENERAL STATEMENTS.

1. Degrees

The degree of Bachelor of Science is conferred upon graduates of all the four years' courses, except the general course in agriculture. The diploma given to graduates of the technical courses contains mention, also, of the special line of technical work pursued.

The degree of Master of Arts, or Master of Science, is conferred upon graduates of the State College, of at least three years' standing, who are known to have been systematically pursuing scientific, literary or professional studies, or who have, satisfactorily to the faculty, studied at least one year in the graduate courses. Higher degrees, such as C. E., Ph. D., D. S., etc., are only conferred at the end of prescribed courses of advanced study, or in recognition of high professional attainments.

2. Graduate Instruction.

Persons who have been graduated in one of the above regular courses, or equivalent courses elsewhere, are permitted to enter the college for instruction in an advanced course, consisting of such studies as may, in view of the circumstances of each case, be approved by the faculty, receiving at the completion of such course the appropriate degree.

3. Libraries and Reading-rooms.

The library belonging to the College has about four thousand volumes, embracing scientific and technical works, memoirs, scientific essays, agricultural and educational works, etc., in English, French and German, forming the nucleus of an excellent scientific library. From four to five hundred volumes per year are being added.

The reading-room in connection with the College library offers to faculty and students an ample and well-selected list of scientific and other periodicals, foreign and American.

Donations of books and periodicals are invited from friends of the institution, publishers and authors.

Each of the two students' literary societies has a good library of standard and miscellaneous works, and a reading-room supplied with many of the principal literary periodicals and newspapers of the day.

4. Free (Senatorial) Scholarships.

There have recently been established by the trustees fifty scholarships, one for each senatorial district in the State, entitling the holder to *exemption from all College charges* (except for materials used in the laboratories), in any of the regular four-years' College courses. The scholar, male or female, is to be appointed by the Senator of the district, after a competitive examination in the studies required for admission to the freshmen class. No person is eligible as a candidate who has previously been admitted to any class in the College.

The holder of the scholarship is admitted to the privileges of any of the regular College courses (*but not the preparatory or special courses*) free of the ordinary charges for incidentals, room rent and furniture; this immunity to continue for the entire College course, provided that both conduct and class standing be satisfactory to the faculty. A vacancy may be filled before the opening of the College year, if the appointee's attainments do not fall below the standard of the class at the time of the application for admission. For information as to vacancies, time and place of examination, etc., candidates for a scholarship should apply to their Senator, in whose hands the details of appointment have been placed by the College.

5. Discipline.

The discipline of the College is intended to be strict, but reasonable and considerate. It assumes that students come here not to spend their time in idleness, but to prepare themselves for useful and honorable careers in life. The aim of the faculty is to lead students to cultivate habits of steady application, self-control, a high sense of honor, truthfulness, and an interest in maintaining the purity of the moral atmosphere of the institution. Those who are not disposed to support heartily a discipline of this kind are urged not to apply for admission. Students whose influence, after fair trial, is found to be injurious to good scholarship or good morals, will be removed from the institution.

6. Expenses.

No charges whatever is made for tuition, except for special instruction in music.

Incidentals.—Each student, whether from a distance or a resident in the neighborhood, is required to pay $17 a year for the fuel, lights, and care of the recitation and other public rooms, viz: $7 for the fall session, $5 for the winter and $5 for the spring. This is the only charge made to pupils who do not room in the College. The charges to those who room in the College are as follows:

Fall Session.—	Incidentals,	$7 00
	Room-rent, fuel, furniture and light,	12 50
Winter Session.—	Incidentals,	5 00
	Room-rent, fuel, light and furniture,	15 50
Spring Session.—	Incidentals,	5 00
	Room-rent, fuel, light and furniture,	9 00

The charge for room rent, fuel and furniture and light is made on the basis of two persons to each room. In cases where a student rooms alone, he will be charged $4 additional per session, besides extra charge for light.

By a resolution of the board of trustees, each student, before he is permitted to enter his name upon the College roll, is required to pay an amount sufficient to cover all his College bills for the current session, besides a special deposit of $5 as a security against damages; or, in case he cannot pay immediately, to give a note, with sufficient security, for the payment at some future time, unless excused by the executive committee.

Laboratory Expenses.—Students in the laboratories pay a small charge for their outfit; also, for apparatus destroyed and material consumed by them.

Boarding —The College does not maintain a boarding hall, and most students depend upon the boarding houses in the vicinity, the regular charge being three dollars per week. The College offers special facilities to those who board themselves singly, and also to the College Boarding Club, which supplies its members, now numbering more than forty, with good boarding at about two dollars and a quarter per week.

Furniture.—The furniture provided for students who room in the building consists of a bedstead, mattress, table, washstand and chair. The student provides all other articles, including bedding, wash-bowl and pitcher, mirror, lamp, etc.

Uniform —Each cadet is required to provide himself with a uniform of dark blue cloth—coat, pantaloons and cap—as per pattern in the College. The cap and pantaloons are such as may be worn upon any occasion without attracting undue attention. One dress coat, with proper care, will last during an entire college course. Measures are taken at the College, and orders filled by Wanamaker and Brown, Philadelphia. The uniform must be paid for when ordered.

Music.—Instruction on the piano or organ is given at the rate of ten dollars for twenty lessons, and three dollars per quarter for use of instrument in practicing.

Washing is at the rate of fifty cents per dozen.

Books and Stationery can be procured at stores in the village at Philadelphia retail prices.

Damages.—Persons causing special damages will be required to pay for the same. General damages will be assessed upon the body of students.

All remittances should be made to the President, State College, Centre county, Pa., by draft, or by money order drawn on State College post-office.

SESSIONS AND VACATIONS.

The college year is divided into three sessions:

The Fall Session of about fourteen weeks, beginning on the second Wednesday of September and ending on the third Friday of December; the Winter Session of twelve weeks, and the Spring Session of twelve weeks.

VACATIONS.—The winter vacation is three weeks, the spring, one, and the summer, ten.

ADMISSION TO COLLEGE.

Examinations for admission are held on Tuesday of Commencement week and on the day before the opening of the fall session, the dates being, for 1889, the 25th of June and the 10th of September, respectively. It is desirable, on every account, that candidates be present on one or both of these days. Those who cannot do so will be examined at any time during the year and admitted to the class for which they are found prepared.

In all cases the applicant for admission must present evidences of good character, and, when coming from another college, of honorable dismissal.

For admission to the Freshman class candidates (of either sex) must be at least fifteen years of age, and pass a satisfactory examination in the following subjects:

1. FOR THE COURSES IN GENERAL SCIENCE, CIVIL AND MECHANICAL ENGINEERING AND ELECTROTECHNICS: English Grammar; Arithmetic; Geography, both Descriptive and Physical; United States History; Higher Algebra, through Quadratics and Progressions; Wentworth's Geometry, four books; and the elements of Natural Philosophy, as much as is contained in Avery, Rolfe and Gillet, or Gage.

2. FOR THE LATIN-SCIENTIFIC COURSE: the same as above, with the addition of four books of Cæsar and four orations of Cicero.

3. FOR THE GENERAL COURSE IN AGRICULTURE: Robinson's Complete Arithmetic (or its equivalent) to ratio; English Grammar (Syntax and Etymology); Geography and Spelling.

4. FOR THE SPECIAL COURSE IN AGRICULTURE: the same as for the General Scientific Course.

5. FOR THE SPECIAL COURSE IN CHEMISTRY: applicants will be admitted without examination, except in Mathematics.

In that branch, at present, the applicant must be fully prepared to pass examination in arithmetic, including the Metric system, and the first two hundred pages of Newcomb's Elementary Algebra; but, in order to derive the greatest advantage from the course, it is recommended that students be so far advanced as to have completed the Mathematical Studies of the Freshman year.

6. FOR THE COURSE IN MECHANIC ARTS: the same as for admission to the General Course in Agriculture.

7. FOR THE LADIES' COURSE IN LITERATURE: the same as for the General Science Course.

8. FOR PARTIAL COURSES, applicants must at least be prepared to en-

ter the Freshman class in the branches of study which they wish to pursue.

9. GRADUATES OF STATE NORMAL SCHOOLS and of a SELECT LIST OF HIGH-SCHOOLS AND ACADEMIES in Pennsylvania, whose standard of requirements has been ascertained to be satisfactory, will be admitted to the Freshman class without further examination in studies which, as shown by their diploma or certificate, they have successfully completed in such institution. Such certificates must show specifically the amount of work done.

10. THE HOLDERS OF SENATORIAL SCHOLARSHIPS are admitted on the certificate of the Examining Committees in the several Senatorial districts.

11. APPLICANTS FOR ADVANCED STANDING, in any course, must pass a further examination in the studies which have been pursued by the class for which they are candidates.

THE FULL COURSES OF INSTRUCTION occupy four years, with three terms, or sessions, in each year. The following schedules of studies indicate the amount of work required in several of the courses or the equivalent which will be accepted from candidates for advanced standing.

1. GENERAL COURSE IN AGRICULTURE.

First Year.

FALL SESSION.—Arithmetic (4), Physiology (4), United States History (3), English Grammar (5).

WINTER SESSION.—Algebra (5), U. S. History (5), English Composition (5).
Practicum.—Zoology, Laboratory Work.

SPRING SESSION.—Algebra (5), Botany (5,) English Composition (5).
Practicum.—Book-keeping.

Second Year.

FALL SESSION.—Algebra (4), Geometry (2), Natural Philosophy (4), Elements of Agricultural Chemistry (5).
Practicums—Drawing (4), Horticulture (4).

WINTER SESSION.—Algebra (4), Geometry (2), Natural Philosophy (4), Elements of Scientific Agriculture (5).
Practicum.—Mechanic Arts (6),

SPRING SESSION.—Algebra (2), Geometry (4), Descriptive Botany (4), Elements of Scientific Agriculture (5).
Practicums—Botany (4), Horticulture (4).

Third Year.

FALL SESSION.—Chemistry (4), Horticulture (3), Geometry (3), Mechanics (4)
Practicums—Chemistry (4), Zoology (4), Mechanics (4).

WINTER SESSION.—Chemistry (4), Geometry (3), Trigonometry (3), Zoology (4).
Practicums—Chemistry (8), Zoology (4).

SPRING SESSION.—Agricultural Engineering (3), Comparative Physiology (3), Trigonometry and Surveying (5), Mental Science (4).
Practicums—Chemistry, one-half term, (Quantitative Analysis.) (10), Surveying one half term (8).

Fourth Year.

FALL SESSION.—Agricultural Chemistry (3), Anatomy and Breeding (4), Botany (4), Political Economy (4).
Practicums—Dissection (2), Chemistry (Quantitative Analysis) (4), Botany (4).

WINTER SESSION.—Agricultural Chemistry (4), Feeding (4), Veterinary Science (3), Constitutional Law (4).
Practicums—Care of Stock (4), Analysis of Agricultural Products (6).

SPRING SESSION.—Fertilizers (4). Entomology (4), Dairy Farming (3), Moral Science (4).
Practicums—Agriculture (6), Entomology (6).

2. ADVANCED COURSE IN AGRICULTURE.

[The studies of the first two years in this Course are the same as in the General Science or the Latin-Scientific Course.]

Junior Class.

FALL SESSION.—Rational Mechanics (4), Agricultural Chemistry (3), Cryptogamic Botany (4), Logic (3).
Practicums.—Physics (4), Chemistry (6).
WINTER SESSION.—Physics (4), Agricultural Chemistry (4), Zoology (4), Agricultural Engineering (3).
Practicums—Zoology or Physics (4), Chemistry (6).
SPRING SESSION.—Mineralogy (1), Mental Science (4), Entomology (2), Fertilizers (4), Crops (1), Zoology (2).
Practicums—Agriculture (4), Entomology (6).

Senior Class.

FALL SESSION.—Anatomy and Breeding (4), Geology (4), Political Economy (4), Horticulture (3), Crops (2).
Practicums—Agriculture (5), Dissection (5).
WINTER SESSION.—Geology (2), Constitutional Law (4), Feeding (4), Veterinary (4), Farm Economy (1).
Practicum—Agriculture (10).
SPRING SESSION.—Dairy (3), Sheep Husbandry (1), Moral Science (4), History of English Literature (3), History of Agriculture (1).
Practicum—Agriculture (original work), Thesis.

3. SPECIAL COURSE IN AGRICULTURE.

[See explanation on previous page.]

First Year.

FALL SESSION.—Chemistry (4), Algebra (3), Geometry (3), Natural Philosophy (4).
Practicums—Horticulture (4), Chemistry (4), Drawing (4).
WINTER SESSION.—Chemistry (4), Agricultural Engineering (3), Trigonometry (3) Geometry (3).
Practicums—Chemistry (8), Mechanic Arts (6).
SPRING SESSION.—Chemistry (3), Physiology (3), Botany (4), Trigonometry (5).
Practicums—Chemistry (4), Horticulture (2), Botany (4), Physiology (2).

Second Year.

FALL SESSION.—Agricultural Chemistry (3), Anatomy and Breeding (4), Botany (4).
Practicums—Chemistry (6), Dissection (5).
WINTER SESSION.—Agricultural Chemistry (4), Cattle Feeding (4), Zoology (4).
Practicums—Chemistry (6), Zoology (4), Agriculture (6).
SPRING SESSION.—Fertilizers (4), Entomology (4), Dairy Farming (4), Sheep Husbandry (1), Zoology (2).
Practicums—Entomology (6), Agriculture (6), Surveying (3).

4. GENERAL SCIENCE COURSE.

Freshman Class.

FALL SESSION.—Algebra (3), Geometry (3), German (5), History (4).
Practicums—Drawing (4), Horticulture (4).
WINTER SESSION.—Trigonometry (3), Geometry (3), Rhetoric (4), German (5).
Practicums—Drawing (2), Mechanic Arts (6).
SPRING SESSION.—Trigonometry and Surveying (5), Physiology (3), German (5), Tactics (2).
Practicums—First half of session—Horticulture (4). Second half of session—Physiology (4); Drawing all the session (6).

Sophomore Class.

FALL SESSION.—Analytical Geometry (4), Chemistry (4), German (2), French (3)' History (2), Surveying (1).
Practicums—Surveying (4), Chemistry (4).
WINTER SESSION.—Analytical Geometry (4), Chemistry (4), German (2), French (3), History (2).
Practicums—Chemistry (8), Mechanic Arts (2).
SPRING SESSION.—Chemistry (3), Descriptive Botany* or Railroad Surveying (4), History (2), French (3), Differential Calculus* (4).
Practicums—Chemistry (6), Botany (4).

Junior Class.

FALL SESSION.—Rational Mechanics (4), French (2), German (2), Logic (3), Botany (4), or Integral Calculus (3).
Practicums—Mechanics (4), Botany (4), Anatomy and Physiology (4).
WINTER SESSION.—Physics (4), French (3), Zoology (4), Constitutional History (4).
Practicums—Physics (4), Zoology (4), Botany (2).
SPRING SESSION.—Physics (4), Mineralogy (1), Mental Science (4), English Literature (4), Zoology (2).
Practicums—Physics (3), Mineralogy (6).

Senior Class.

FALL SESSION.—Physics (4), Geology (4), Political Economy (4), English Literature (3).
Practicums—Physics (2), Geology (5).
WINTER SESSION.—Geology (2), Constitutional Law (4), Astronomy (3), History of Civilization (4), Physics (3).
Practicums—Geology (3), Physics (2).
SPRING SESSION.—International Law (4), Astronomy (3), Moral Science (4), History of English Literature (3).
Practicums—Original work—elective (5), Thesis or Oration.

5. LATIN-SCIENTIFIC COURSE.

Freshman Class.

FALL SESSION.—Algebra (3), Geometry (3), German (5), Latin (4).
Practicums—Drawing (4), Horticulture (4).
WINTER SESSION.—Trigonometry (3), Geometry (3), Latin (4), German (5).
Practicums—Drawing (2), Mechanic Arts (6).
SPRING SESSION.—Trigonometry and Surveying (5), German (5), Latin (4).
Practicums—First half of session—Physiology (4). Second half of session—Horticulture (4); Drawing, all the session (6).

Sophomore Class.

FALL SESSION.—Analytical Geometry (4), Chemistry (4), History (2), Latin (3), French (3), Surveying (1).
Practicums—Surveying (4), Chemistry (4).
WINTER SESSION.—Analytical Geometry (4), Chemistry (4), History (2), Latin (3), French (3).
Practicums—Chemistry (6), Mechanic Arts (2).
SPRING SESSION.—Chemistry (3), Descriptive Botany* or Railroad Surveying (4), Differential Calculus* (4), Physiology (3), French (3).
Practicums—Chemistry (6), Botany (4).

[The studies of the last two years in this Course are the same as in the General Science Course.]

6. ADVANCED COURSE IN CHEMISTRY.

[The studies of the first two years in this Course are the same as in the General Science or the Latin-Scientific Course.]

Junior Class.

FALL SESSION.—Chemistry, *Remsen's Theoretical* (4), *Fresenius' Quantitative Analysis* (2), Rational Mechanics, *Daniell's Principles of Physics* (4), Integral Calculus, *Bowser's* (3).
Practicums—Mechanics (4), Chemistry (10).
WINTER SESSION.—Chemistry, *Remsen's Theoretical* (5), *Fresenius' Quantitative Analysis* (1), Physics, *Daniell's Principles of Physics* (4).
Practicums—Physics (4), Chemistry (16).
SPRING SESSION.—Chemistry, *Chemical Technology, Lectures* (5), Physics, *Daniell's Principles of Physics* (4), Mineralogy, *Brush's Determinative Mineralogy* (1), Mental Science, *Seelye's Hickok* (4).
Practicums—Physics (3), Chemistry (3), Mineralogy (6).

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*NOTE.—For the Differential Calculus of this session, students preparing for the Course in Agriculture or Natural History may substitute seven hours of practicum in Chemistry. Students preparing for the Course in Civil Engineering will substitute Railroad Surveying for Descriptive Botany.

Senior Class.

FALL SESSION.—Chemistry, *Remsen's Organic* (4), *Chemical Technology, Lectures* (2), Geology, *Dana's* (4), Political Economy, *Walker's* (4).
Practicum—Chemistry (12).
WINTER SESSION.—Chemistry, *Remsen's Organic* (4), *Plant Chemistry, Lectures* (3), Constitutional Law, *Cooley's General Principles* (4).
Practicum—Chemistry (18).
SPRING SESSION.—Chemistry, *Remsen's Organic* (3), *Animal Chemistry, Lectures* (3), International Law, *Woolsey's* (4).
Practicum—Chemistry (20), Thesis.

7. COURSE IN CIVIL ENGINEERING.

[The studies of the first two years in this Course are nearly the same as in the General Science or the Latin-Scientific Course.]

Junior Year.

FALL SESSION.—Physics (4), Descriptive Geometry, Maps (Shades and Shadows, Perspective) (4), Integral Calculus (3), Surveying (Topographical, Hydrographical and Mining) (3), Least Squares (1).
Practicums—Rational Mechanics (4), Railroad Surveying (4), Draughting (2).
WINTER SESSION.—Applied Mechanics (Analytical and Graphical Statics) (4), Physics (4), Practical Astronomy and Geodesy (3), Engineering Structures (Bridges, Roofs and Arches) (4).
Practicums—Draughting (6), Physics (4).
SPRING SESSION.—Applied Mechanics (Kinematics and Kinetics) (4), Physics (4), Materials of Engineering (3), Mineralogy (1), Engineering Structures (Piers, Retaining Walls and Embankments) (3).
Practicums—Geodesy (4), Mineralogy (6).

Senior Year.

FALL SESSION.—Engineering Structures (Canals, Foundations and Tunnels) (3), Sewerage and Drainage (2), Specifications and Contracts (2), Geology (4), Political Economy (4).
Practicums—Topographical Surveying (6), Geology (4).
WINTER SESSION.—Designing (4), Heat, Steam and Steam Engines (4), Constitutional Law (4), Astronomy (3).
Practicums—Draughting (6), Model Construction (4).
SPRING SESSION.—Hydraulic Engineering (3), Electric Motors (3), Economics of Roads and Railroads (2), Hydraulic Motors (3), International Law (4).
Practicums—Draughting and Thesis (10).

8. COURSE IN MECHANICAL ENGINEERING.

Freshman Class.

FALL SESSION.—Algebra (3), Geometry (3), German (5), History (4).
Practiums—Drawing (4), Mechanic Arts (4).
WINTER SESSION.—Trigonometry (3), Geometry (3), Rhetoric (4), German (5).
Practicums—Drawing (2), Mechanic Arts (6).
SPRING SESSION.—Trigonometry and Surveying (5), Physiology (3), German (5.)
Practicums—First half session—Mechanic Arts (4), Physiology (4), Second half session—Surveying (8).

Sophomore Class.

FALL SESSION.—Analytical Geometry (4), Chemistry (4), German (2), French (3), History (2).
Practicums—Drawing (6), Chemistry (4).
WINTER SESSION.—Analytical Geometry (4), Chemistry (4), German (2), French (3), History (2).
Practicums—Chemistry (8), Mechanic Arts (2).
SPRING SESSION.—Chemistry (3), Mechanism (4), History (2), French (3), Differential Calculus (4).
Practicums—Drawing (6), Mechanic Arts (4).

Junior Class.

FALL SESSION.—Rational Mechanics (4), Integral Calculus (3), Descriptive Geometry (4), Graphical Statics (4).
Practicums—Mechanical Drawing (4), Mechanics or Shop-work (4).
WINTER SESSION.—Analytical Mechanics (3), Method of Least Squares (2), Physics (4), Descriptive Geometry (3), Integral Calculus (2).
Practicums—Mechanical Drawing (5), Shop-work (5).
SPRING SESSION.—Analytical Mechanics (3), Properties of Materials (3), Differential Equations (3), Physics (4).
Practicums—Mechanical Drawing (4), Shop-work (4), Mineralogy (4).

Senior Class.

FALL SESSION.—Quaternions (4), Political Economy (4), Valve Gearing and Experimental work with Indicator and Inspirator (3), Geology (4).
Practicums—Mechanical Drawing (6), Shop-work (6).
WINTER SESSION.—Quaternions (3), Mechanics of Engineering (4), Constitutional Law (4), Astronomy (4).
Practicums—Mechanical Drawing (6), Shop-work (6).
SPRING SESSION.—Astronomy (4) Machine Designing (4), Imaginaries (3), Steam Engine (3).
Practicum—Drawing. *Thesis.*

9. SPECIAL COURSE IN CHEMISTRY.

First Year.

FALL SESSION.—General Chemistry (4), Mathematics (5), German (5).
Practicum—Laboratory Practice.
WINTER SESSION.—Chemistry (4), Mathematics (5), German (5).
Practicum—Qualitative Analysis.
SPRING SESSION.—Chemistry (3), Mathematics (5), German (5).
Practicum—Qualitative Analysis.

Second Year.

FALL SESSION.—German (2), Mathematics (4), Chemistry, with Quantitative Analysis.
WINTER SESSION.—German (2), Mathematics (4), Chemistry, with Quantitative Analysis.
SPRING SESSION.—Mathematics (4), Chemistry, with Quantitative Analysis.

THE PREPARATORY DEPARTMENT.

This department is intended to furnish instruction to students well trained in the Elementary Common School Branches, and yet not fully prepared for admission to the Freshman class. It does not however, offer instruction in the Primary branches, nor is it in any sense a High School. The studies are arranged chiefly with reference to their importance in preparing students for one of the regular four years' College Courses.

Special care is taken to make the instruction systematic and thorough, that the foundation for future study may be securely laid.

Students in this department, except those who are under the immediate care of their parents or guardians, are required to room in that part of the building assigned to the department. Here they are under the personal supervision of the principal of the department and his assistants.

In addition to the regulations governing the College students, they are required to observe study hours. During such periods they must neither pay nor receive visits; and every effort is made to train them to habits of close attention and to correct methods of study. At other times than in recitation and study hours, they have ample opportunity for healthful sports and recreation.

ADMISSION.

FIRST YEAR.—All applicants for admission must be at least fourteen years of age, and be prepared, at the beginning of the autumn session, to pass a satisfactory examination in the following branches:

Arithmetic—Thompson's Complete (or its equivalent) to Ratio; English Grammar, Brown's Revised (or its equivalent), to page 250, which includes Etymology and Syntax.

In Geography, Spelling, Reading and Penmanship, the examination must show such acquaintance with those branches as not to require further instruction in them.

SECOND YEAR.—Those who apply for admission to the autumn session of the *Second Year* must be prepared to pass, in addition to the above, an examination on all the work of the *First Year.*

All persons entering classes after the opening of the first session will be required to pass an examination in the work already gone over by the class into which they seek admittance.

TUITION in this department is free; other charges are the same as in the College proper.

EXAMINATION FOR ADMISSION, Tuesday, September 11, 1888, at nine o'clock, A. M.

SCHEME OF WORK.

In connection with the schedule, the following outline of work will indicate the course of preparatory studies more in detail:

FIRST YEAR.

Fall—Thompson's complete Arithmetic, completed from Ratio.
- Hutchison's Physiology and Hygiene, completed.
- Murray's Essentials of English Grammar.
- Scudder's History of the United States, to part II.
- Comstock's First Latin Book, fifty lessons (optional).

Winter—Newcomb's Elementary Algebra, to page 80.
- Murray's Advanced Lessons in English Composition to part III.
- Scudder's History of the United States, completed.
- Zoology, Morse's First Lessons.
- Comstock's Lessons in Latin, completed (optional).

Spring—Elementary Algebra, continued to page 152.
- Crittenden's English Composition, completed.
- Murray's Advanced Lessons in Analysis, completed.
- Packard's Manual of Book-keeping.
- Cæsar, Books I and II (optional).

SECOND YEAR.

Fall—Elementary Algebra, continued to page 244.
- Wentworth's Plane Geometry, Book I.
- Avery's First Principles of Natural Philosophy, to chapter VII.
- Lancaster's History of England, completed.
- Cæsar, Books III and IV; Allen's Composition, first 13 Lessons (optional).

Winter—Newcomb's College Algebra, from page 85 to 200.
- Geometry, continued through Book II.
- Natural Philosophy, completed.
- Houston's Physical Geography, completed.
- Cicero—First two orations *in Catilinam;* Composition, continued to 24th Lesson (optional).

Spring—Algebra, continued to page 320.
- Plane Geometry completed.
- Botany, Gray's First Lessons.
- Civil Government, Young's Class Book.
- Cicero—Third and Fourth Orations *in Catilinam;* Composition, continued to 34th Lesson (optional).

SCHEDULE OF PREPARATORY STUDIES.

YEAR.	Session.	SCIENTIFIC COURSE.	Hours per week.	LATIN-SCIENTIFIC.	Hours per week.
"B," OR FIRST YEAR.	Fall.	United States History	3	United States History,	4
		Arithmetic,	4	Arithmetic,	4
		Physiology,	4	Physiology,	4
		English Grammar,	5	Latin,	5
	Winter.	Algebra,	5	Algebra,	5
		English Composition,	5	English Composition,	5
		United States History,	5	Latin,	5
		Zoology,	5	Zoology,	5
	Spring.	Algebra,	5	Algebra,	5
		English Analysis,	5	English Composition,	5
		English Composition,	5	Latin,	5
		Drawing,	3	Drawing,	3
		Book-keeping,	4	Book-keeping,	4
"A," OR SECOND YEAR.	Fall.	Geometry,	2	Geometry,	2
		Algebra,	4	Algebra,	4
		Physics.	4	Physics,	4
		English History,	5	Latin,	5
		Drawing,	5	Drawing,	5
	Winter.	Algebra,	4	Algebra,	4
		Geometry,	2	Geometry,	2
		Physics,	4	Physics,	4
		Physicial Geography,	5	Latin,	5
		Drawing,	5	Drawing,	5
	Spring.	Algebra,	5	Algebra,	5
		Geometry,	4	Geometry,	4
		Civil Government,	2	Civil Government,	2
		Botany,	4	Latin,	5
		Drawing,	5	Drawing,	5

The following list shows at a glance the leading departments of study.

1. AGRICULTURE (Three Courses) and AGRICULTURAL CHEMISTRY; with constant illustrations on the Farm and in the Laboratory.
2. BOTANY and HORTICULTURE; theoretical and practical. Students taught original study with the microscope.
3. CHEMISTRY; with an unusually full and thorough course in the Laboratory.
4. CIVIL AND MECHANICAL ENGINEERING; very extensive field and shop practice with best modern instruments.
5. HISTORY; Ancient and Modern, with original investigation.
6. LADIES' COURSE in LITERATURE and SCIENCE; two years. Ample facilities for Music, vocal and instrumental.
7. LANGUAGE and LITERATURE; Latin (optional), French, German and English (required), one or more continued through the entire course.
8. MATHEMATICS and ASTRONOMY; pure and applied.
9. MECHANIC ARTS; combining shop; work with study—three years' course—new building and equipment.
10. MENTAL, MORAL and POLITICAL SCIENCE; Constitutional Law and History, Political Economy, etc.
11. MILITARY SCIENCE; instruction theoretical and practical, including each arm of the service.
12. PHYSICS; Mechanics, Sound, Light Heat, Electricity, etc., a very full course, with *extensive Laboratory* practice.
13. PREPARATORY DEPARTMENT; Two years—carefully graded and thorough.

Fall term opens September 14, 1887; Winter term, January 11, 1888; Spring term, April 5, 1888.

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OF THE

Pennsylvania State Board of Agriculture.

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